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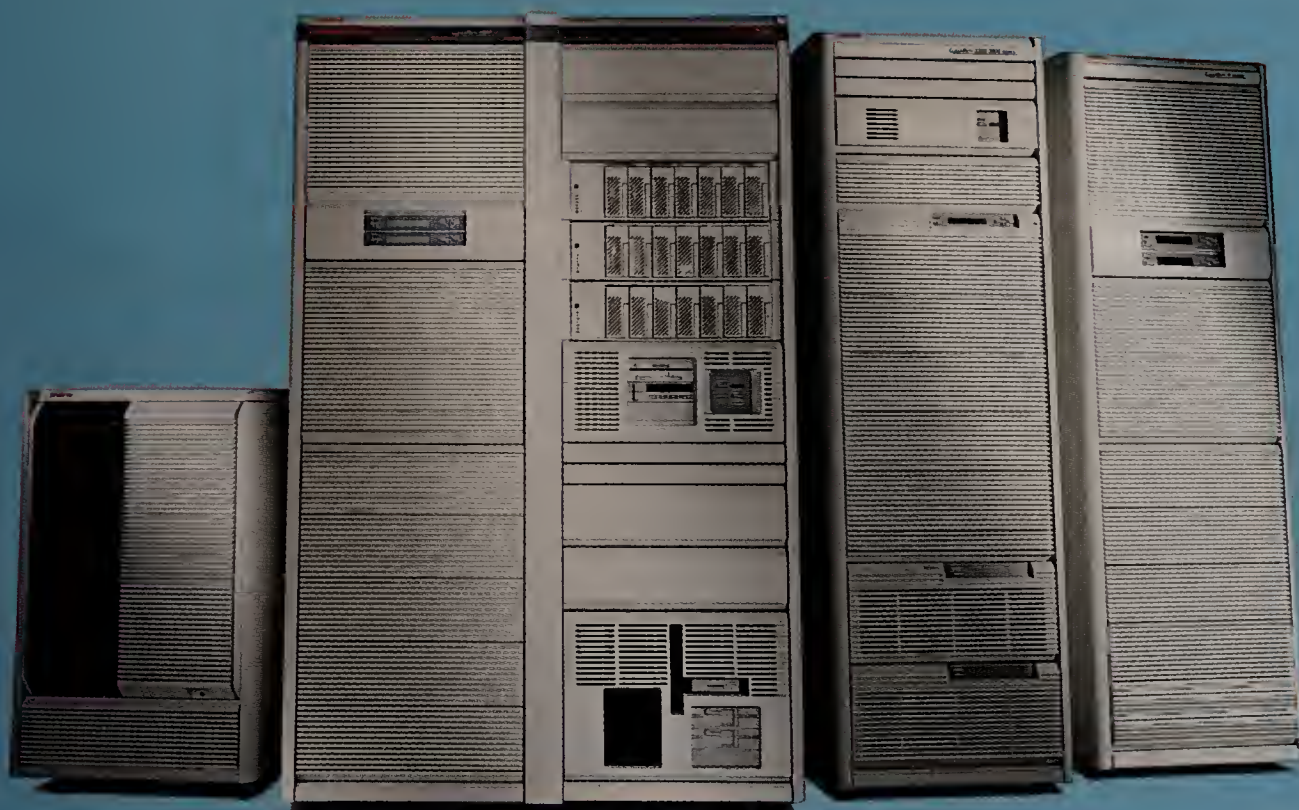
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Data Warehousing

THE ESSENTIAL GUIDE



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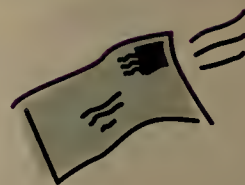


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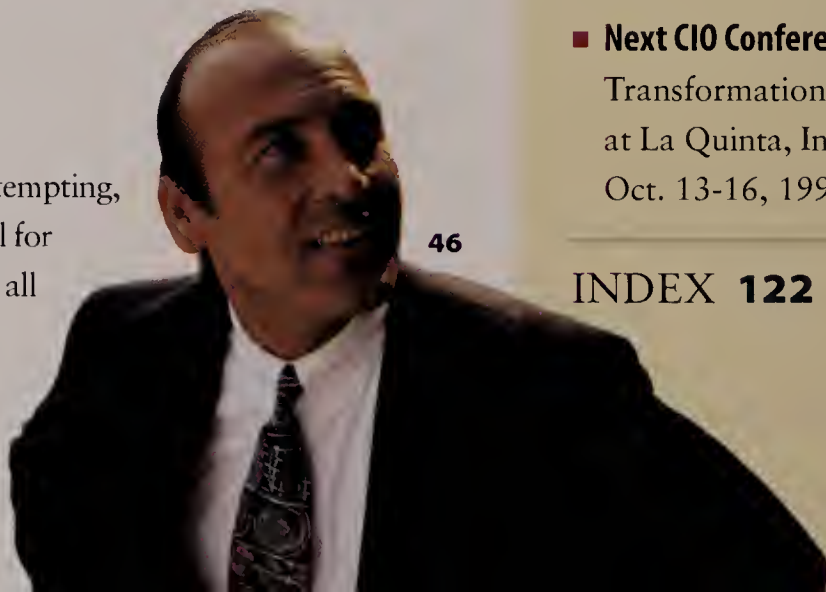
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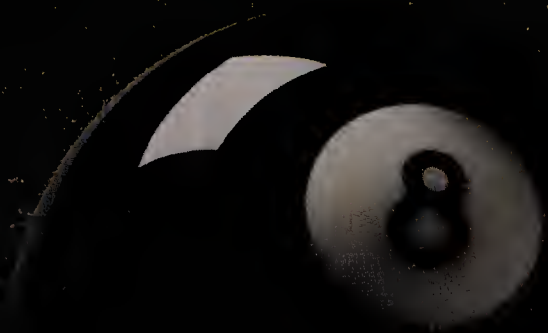
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In Box

LETTER FROM THE EDITOR AND HOW TO REACH US

The first time

I heard about the information age was in 1987, *CIO*'s launch year. I was reviewing a book in which the author described the historical transitions that occurred between the nomadic age and the industrial age. The author suggested that we were in the midst of another such transition, the consequences of which would be just as profound. The idea was appealing, even intellectually convincing, but I would not feel its real impact for some time.



Our first article on data warehousing appeared in 1993. It seemed such an arcane concept, such a technical feat. We covered it in a two-page column. Our first look at data mining was about a year ago. Today, as we devote an entire issue of *CIO* to the subject of data warehousing, it is clear the information age has truly arrived.

Actually, data warehousing makes a lot of sense. Take the information from your business transactions, store it where anyone who needs it can get it and provide users with the analytical tools to use the data to make better business decisions. When an organization's survival can hinge on having better information than its competitors and being able to exploit it more effectively than they do, technology that makes that possible is going to attract serious attention.

We hope the articles in this issue will prove useful in formulating your company's plans for data warehousing. Discover which approach makes most sense for your particular situation in "Charting a Course," Page 46, by Jennifer Bresnahan, and learn the importance of business-user involvement in the design phase in "Views You Can Use," Page 60, by Carol Hildebrand. E.B. Baatz's "Digesting the ROI Paradox," Page 32, and "What's It Worth?" Page 78, examine the payoff you can expect from a data warehouse implementation. In "Just Browsing, Thanks," Page 98, Heath Row looks into new ways of accessing corporate information.

Senior Writer Carol Hildebrand deserves credit and many thanks for overseeing and providing content leadership for this special issue.

Abbie Lundberg

P.S. Please send letters to the editor to lundberg@cio.com or to Letters, *CIO* Magazine, 492 Old Connecticut Path, P.O. Box 9208, Framingham, MA 01701-9208.



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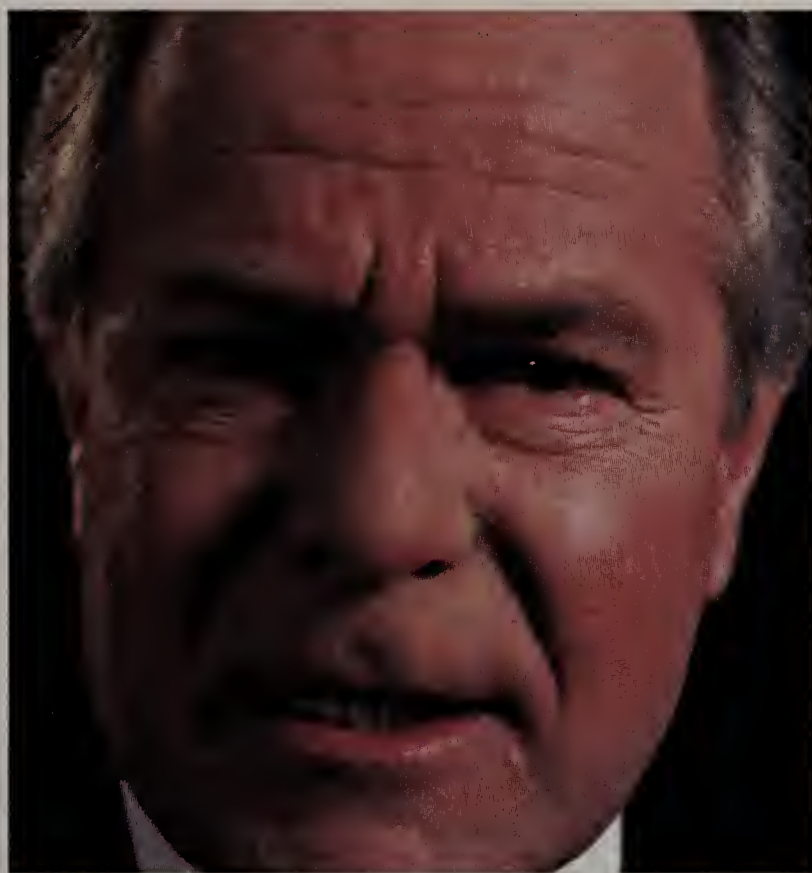
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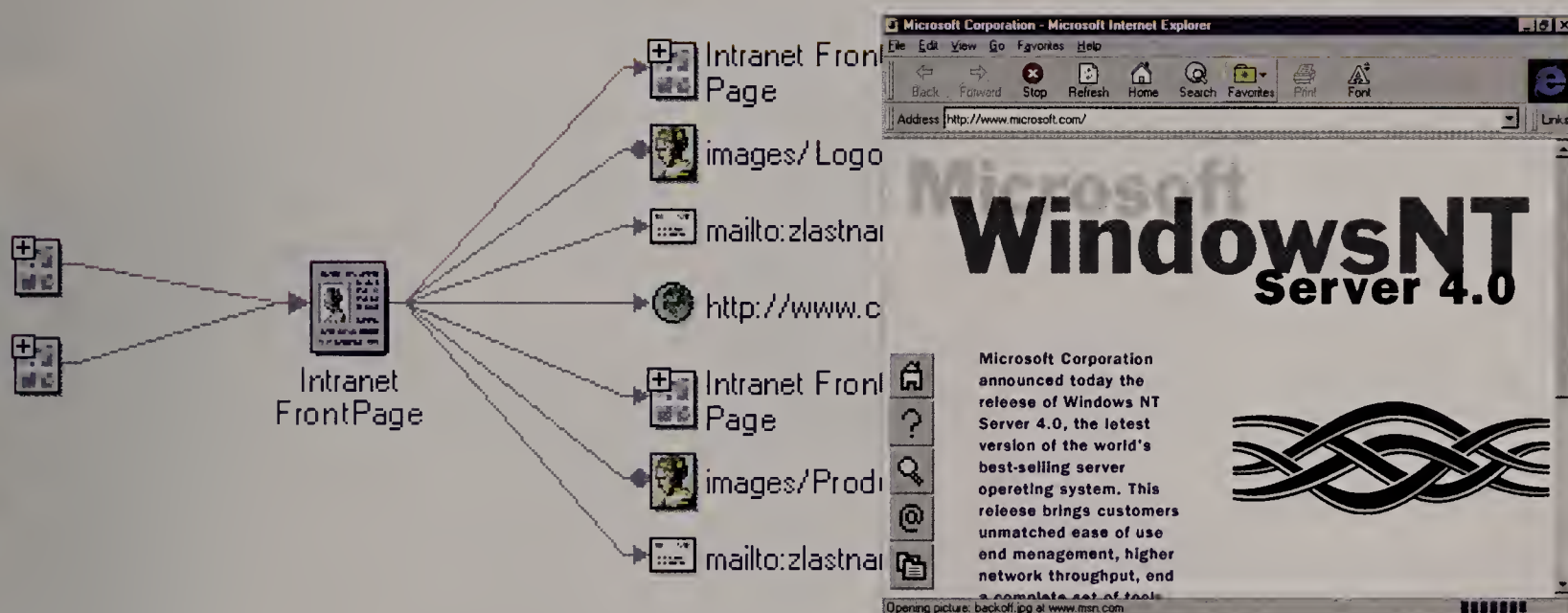
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Trendlines

NEWS, INSIGHT, HUMOR, VIEWS

Edited by Alice Dragoon

How to Cow Da Bulls

DATA MINING Dennis "The Worm" Rodman may be one of the top stars of the Chicago Bulls, but when pitted against Seattle Supersonics reserve player Frank Brickowski, he loses his cool. Sonics coach George Karl learned this useful fact in the middle of the 1996 NBA finals when he used an IBM Corp. data mining tool, Advanced Scout, to analyze plays from his team's first three championship games against Chicago. He discovered that whenever Brickowski got off the bench to face Rodman, Seattle actually outscored the Bulls. Karl made it a point to play Brickowski more and, sure

enough, Seattle upset Chicago in the next two games.

The NBA has always collected game data, but coaches have never before had a meaningful way to process it in time to make a difference from one game to the next. Two years ago, IBM Research Scientist Inderpal Bhandari worked with the New York Knicks and Orlando Magic to develop Advanced Scout, which sifts through game data to detect statistical patterns. Bhandari's goal was to help coaches make informed strategy decisions—and to show that data warehouse technology has applications in

virtually every industry. "Everyone is suffering from information overload," he says.

"Corporations should start thinking of data mining for not just their analysis departments but for every employee from the security guard to the CEO."

Currently 15 of the 29 NBA teams are interest-

ed in Advanced Scout, although last season only the Knicks, Magic and Sonics actually used it. The Magic rely on it to find the best

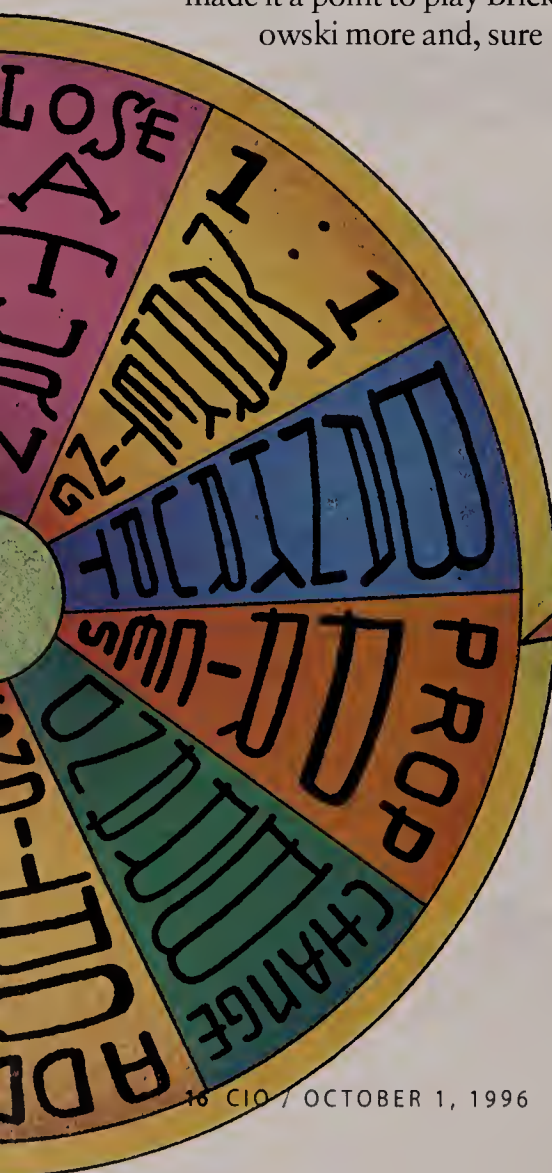
combination of players and evaluate weaknesses, according to Assistant Coach Tom Sterner. "Given that your talent and your opponent's talent are about the same, there's got to be something to separate you from them," he explains. "If coaches can have as much information as possible, then they can make smarter deci-

Deal of Fortune

MARKET SIMULATION In today's information-intensive "smart markets," companies succeed by managing customers, not brands or products. To give them hands-on experience doing just that, Rashi Glazer, a professor of marketing at the Haas School of Business at UC Berkeley, has designed a computer simulation game called Strategic Use of Information Technology Simulation, or Suits. Although traditional simulations tend to be what he calls "data poor," Glazer says that "Suits is designed to mirror the information-intensive environment that firms actually work in."

Teams first decide whether to organize their "company" by product, by function or, thinking in smart market terms of mass customization, by customer. Glazer provides basic access to a database filled with customer information that's frequently pulled from live company databases. But teams that really want to take advantage of all that information must invest in the technology, kind of like buying a vowel on *Wheel of Fortune*. ("I'd like to buy a query tool that lets me look for customers who want a minivan for under \$20,000, please, Pat.")

Next, teams submit "moves," such as, say, rolling out a new product. Then the computer runs the model and the performance results, along with changing market conditions, are the basis for the next period's moves. The game lasts several days and by the time players have finished, says Glazer, "they start thinking strategically about information, and how IT supports that." ■



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Trendlines

Abolishing Term Limits

DEFINITIONS So you might be interested in discussing granularity with your colleagues, if only you knew what the darn word meant. Here at CIO, we feel your pain. Operating under the principle that it's much easier to forge ahead with a data warehouse if you have a firm grasp of the concepts involved, we offer you these basic terms, defined by Rod Newing for London-based Prime Marketing Publications Ltd.'s *Conspectus* magazine:

da·ta mart: A subset of information relevant to a group of users that is transferred to a separate departmental workgroup server to cut down on network traffic. The database involved can be relational, although a multi-dimensional OLAP server is often more appropriate. A range of tools can be used to access the data in a data mart.

da·ta ware·house: A separate database dedicated to decision support. Data is transferred from transaction processing systems and integrated. It is arranged by customer—not date or transaction. It provides management information through report writers, query tools, data access and retrieval tools, OLAP servers and enterprise information systems. It is a software architecture, not a product.

de·ci·sion support tools: Software tools that allow managers to make decisions by reviewing, monitoring and manipulating the data in the warehouse. More sophisticated than query tools, these mostly read-only decision support tools also involve some modeling and forecasting, so some data will need to be written to the database. They usually operate from a data mart.

gran·u·lar·i·ty: A description of the level of detail contained in the warehouse. The more detailed the information, the finer the granularity. Coarse granularity suggests that only summarized information is stored.

in·te·gra·tion: The process of bringing together related data from different sources to arrange it by customer. This may involve transactions with the same customer from different transaction processing systems.

me·ta da·ta: Data about data. It describes the data within a warehouse, including hierarchical relationships, stored formulas, item descriptions, data sources, data update status, formatting information, currency conversion information, time series information, notes for reporting, security and access controls, availability of pre-calculated summary tables and data storage parameters.

pro·to·type: A small, discrete data warehouse application built initially to prove the concept and allow the benefits of a full-scale project to be identified and quantified. It contains a subset of data and is aimed at solving a very specific business problem. It should be built very quickly and allow users to work with live data and identify and refine their needs for a full system.

re·sponse time: The time it takes software to execute a command issued by the user. This is critical when working with warehouse data using interactive analysis, as the software needs to keep up with the user's chain of thought. It should be less than five seconds and preferably under one second.

SQL: Pronounced "sequel," the Structured Query Language is a standard data definition and manipulation language for relational database systems. It is used to define queries to be performed on a data warehouse and is generally used by computer professionals, but some of software tools can translate English language user queries into SQL code invisibly. ■

sions that will give that competitive edge."

Speaking on a cellular phone over the din of the Magic team bus, Sterner says he is most excited about the video capability that IBM is building into Advanced Scout. When coaches think they've discovered a trend, they can link the plays revealed through data mining with the corresponding video footage. A time-code stamp enables them to pull up the specific play without having to search through reels of footage. This capability is especially important, says Sterner, because "sometimes stats lie."

For more information, visit www.research.ibm.com/scout/.

—Jennifer Bresnahan

More Meta Data...

Aaron Zornes of Meta Group Inc. offers these definitions:



Data warehouse: A subject-oriented information store designed specifically for decision support

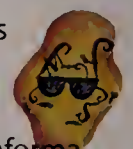


Data mart: A subject-specific data warehouse; often departmental or line-of-business; usually under 50GB

Online analytical processing (OLAP): Multidimensional tools for accessing, storing and manipulating decision support and EIS-style information



Data mining: Knowledge-discovery process for extracting previously unknown, actionable information from very large databases



Data visualization: Graphical rendering of information from data warehouses ■

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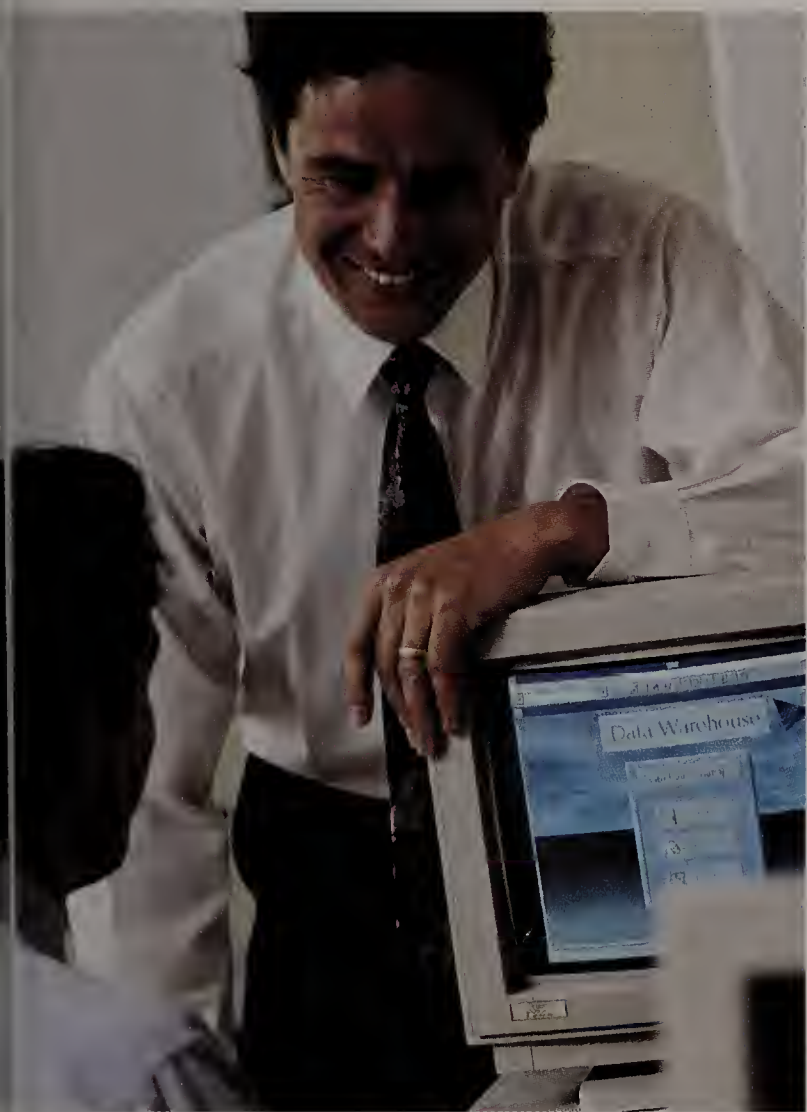
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Trendlines

Not the Data Warehousing Dictionary

HUMOR According to Harry Zimmer of IBM Corp.'s Consumer Driven Solutions, data "warehouse" is just about the most unlikely moniker for what information systems people are building. Overheard at the Information Management Forum meeting in Toronto in November 1995, here is Zimmer's vivid vocabulary of alternative data warehousing terms. Which one are you building?

Data Outhouse

When IS moves at the speed of light to deliver a data warehouse, the outcome most likely will be a data outhouse. There's no data modeling, no list of user requirements, no alignment to the business—just a big mess. "When a company gets to the data outhouse stage, someone usually gets fired," says Zimmer. That stinks.



Data Basement

Access tools are poor and the end users are not trained. Result? Even the biggest and best data warehouses become data basements. They're loaded with great data, but nobody is brave enough to rummage around to find what they need. "In many organizations it takes time to close the data basement," says Zimmer. "Especially if the person who built it is still around."



Off the Shelf

Data Warehousing Resources

The staff at CIO can't imagine why anyone with this magazine in hand would need other sources of information about data warehouses. However, in the unlikely event that a few of you feel compelled to look further, CIO recommends the following resources:



Alan R. Simon's Strategic Database Technology: Management for the Year 2000 (Morgan Kaufmann, 1995) covers technical and managerial considerations for IS planning. The preface includes a schematic map of the book's contents, a flow chart of ideas that suggests pathways among topics that lets readers extract desired information speedily. For example, a reader's eye can trace a logical line from Chapter 2, "Principles of Distributed Information Management," to Chapter 4, "Data Warehouses," assured by the map that skipping Chapter 3, "Client/Server Databases and Middleware," will not hinder comprehension. Best of all, each chapter is headed by a shadow box that includes a note to the CIO, an executive summary and a hundred or so words about what this technology can do for you—three plain-English pre-views of the information to come.

Two how-to books with bindings worth cracking for technical discussions are W.H. Inmon's **Building the Data Warehouse** and Ralph Kimball's **The Data Warehouse Toolkit: Practical Techniques for Building Dimensional Data Warehouses** (both from Wiley, 1996). Inmon explores the options and trade-offs for different environments and architectures. The useful final chapter, "A Data Warehouse Design Review Checklist," lists 54 considerations, explains succinctly why each is important and refers readers to the relevant sections of the book. Kimball states up front that CIO-types will find that the book helps them understand what technicians need to do their jobs; some CIOs will find the glossary alone worth the cover price, while others will find value in Kimball's chapters about specific industries such as banking and insurance.

If you learn best by learning what others know, fire up the desktop, load your browser and surf to **The Data Warehousing Institute** (www.tekptrn.com/tpi/tdwi/index.htm) where you'll find for sale more than a dozen data warehouse case studies on the likes of Glaxo, Sara Lee, Transamerica and Woolworth. The site also features a data warehousing roadmap that identifies the different components of data warehousing and the tools used for each. And finally, as long as you're online, stop at **NewsPage** (www.newspage.com/NEWSPAGE/newspagehome.html) a daily information service from Individual Inc., where you can click your way from Computer Software to Database Software to Data Warehousing in search of the latest news.

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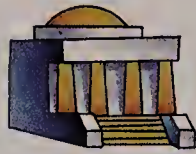
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Trendlines

Data Mausoleum

When a company has spent an exorbitant amount of money building a data basement, usually with the help of a large consulting company, we have a blueprint for a data mausoleum. "The distinction between the basement and the mausoleum is that it takes more money to build the latter," says Zimmer.



Data Tenement

The project plan calls for a six-month implementation phase. But problems arise, milestones come and go, and soon all construction is halted. A data tenement is born. "A data tenement normally reaches 70 percent completion and then gets stuck," says Zimmer. "It could eventually be fixed over time, sort of like a deep gash on your skin that eventually heals." Maybe we need a data hospital?

Data Shack

Predominant in North America, data shacks spring up when there isn't enough money to fund the project completely from start to finish. The CFO doles out the budget so slowly that the technology changes between installments of funding. And unless the project is scaled back to reflect the spending constraints, disaster is imminent. "As a rule of thumb," says Zimmer, "whatever you think you should ask for, multiply by two."



Data Cottage

The end users want a functional data mart, so they bypass IS and quickly build their own little data cottage. They don't care about the latest technology. They don't care about elegant data models. And they don't care about comprehensive tool analysis. They just want something that works. "They give control of the project to a guy who has been writing Lotus 1-2-3 code for the past five

Findings Warehousing Woes

Owning the Problem

Three of every four IS managers say data problems continue to beset their data warehouse projects, according to a survey of 97 IS managers conducted at the June 1996 Information Management Forum meeting in Toronto. Data ownership and responsibility is by far the most prevalent issue, affecting 65 percent of the companies surveyed. Of those, 62 percent say solving the ownership problem has been difficult or very difficult.

About 23 percent of the IS managers surveyed say they experience technical problems with the data, such as size and complexity. Data quality and accuracy problems affect 16 percent. Other data conundrums include integration with legacy systems and access rights.

After data issues, IS managers say project sponsorship and funding questions as well as system performance and resource issues are their next biggest unresolved problems. With 48 percent of those surveyed spending between \$1 million and \$2 million to build a data warehouse and 17 percent spending a whopping \$5 million or more, many IS managers appear to be in budget shock.

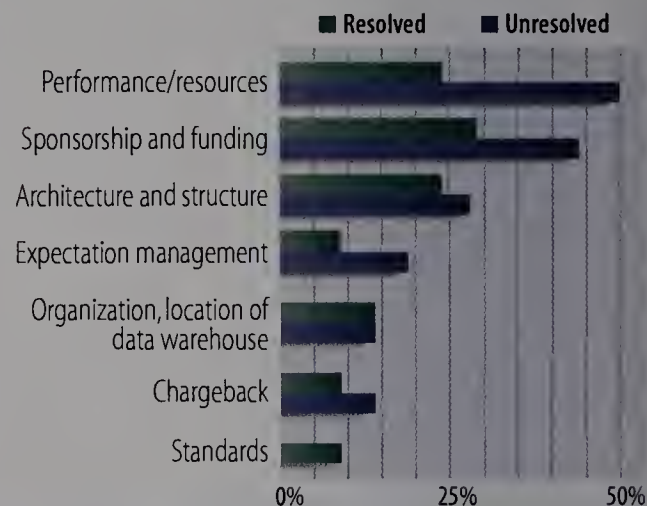
Only about one in four companies have had formal training in data warehousing for their IS departments, although 16 percent plan to start such training programs. Only one in three companies offer formal training for end users. Upgrading database administrator skills remains a popular action item, too. Thirty-nine percent of the companies say IS staff additions have been made or are being considered.

The Information Management Forum is an international membership organization of senior IS and business managers from Fortune 1000 companies. For more information, contact Bill Huffstutler, managing director, at 770 455-0070 or at timf@mindspring.com.

—E.B. Baatz

Ranking Data Warehouse Problems

Beyond data difficulties, many companies have problems with data warehousing. Some have resolved them, others are still struggling.



SOURCE: INFORMATION MANAGEMENT FORUM SURVEY, JUNE 1996

years," says Zimmer. "They're renegades but are good to partner with if you get the chance."

Data Condominium

Taking all the data cottages and tying them together creates a data condominium. The cot-



tages probably worked individually, but getting them to work together, like any group of contentious condo owners knows, isn't much fun. The classic kludge problems arise. "Putting all the cottages together leads to a very poor solution," says Zimmer. "Data integrity issues and politics will trip you up." ■

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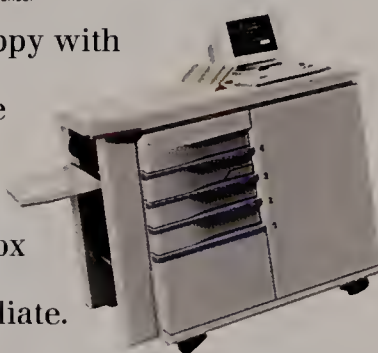
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THE ESSENTIAL GUIDE

What's It All About?

A data warehouse can do a lot for an organization.
Before creating yours, make sure you've covered all the bases.

So you're contemplating a data warehouse implementation and company enthusiasm is running high. Join the club. Data warehouses have been hyped almost as much as the Web and perhaps with more reason: They offer a realistic chance of harnessing business knowledge to garner competitive advantage.

A warehouse is essentially a database of historical and functional business information fed by the mainframe; however, it's arranged according to business logic rather than computer logic, and users can query it at will for whatever information strikes their fancy.

A good warehouse is like the holy grail to business professionals frustrated by years of struggling with preformatted reports off the mainframe. The warehouse has the mainframe information, but it will bend to business needs. No wonder your colleagues and CEO are salivating—all that enticing business data is just waiting to be analyzed and parsed within an inch of its life.

A word to the wise. Building a data warehouse can be even more challenging than plan-

ning a company holiday party. First of all, no matter how hard a CIO works, there will always be some who turn up their noses at the result. Even worse, unless co-workers are included in the planning process, you could end up with a warehouse that doesn't answer the business's needs. It's like throwing a black-tie Yuletide affair for a crowd who prefers the local bowladrome.

There's a high user-involvement quotient to building a warehouse, and CIOs who ignore it do so at their own risk. Chris Horrocks, a senior partner with Computer Sciences Corp., cites numbers his company collected at the past two conferences of the Life Office Management Association (LOMA), a member organization for companies in the life insurance

industry. Its conferences draw attendees with job titles from the systems manager level up to senior managers. In 1995, 91 percent of about 50 LOMA conference attendees said their warehouses had failed to generate a return on investment. In 1996, 85 percent of a comparable number of respondents felt the same way. The problem, they said, was that the projects didn't answer a business need. In other words, users weren't consulted during the design phase of the warehouse projects.

Smart CIOs can increase their warehouses' chances of success in a number of ways. First, know your industry. The driving force behind a government data warehouse is likely to differ markedly from that of a health-care warehouse. By analyzing major industry forces and linking them to warehouse ROI, CIOs can build a solid business foundation for a warehouse.

More than any other IS project, a warehouse must conform to users' needs, and that's a difficult concept to translate into code. Users almost have to lead the development effort to ensure the warehouse contains the right data in the right format. At the very least, IS must go beyond lip-service analyses such as user surveys in order to get a truly "useful" warehouse. Sears, Roebuck and Co., for example, has devoted several business executives to its warehouse development team, resulting in a warehouse that caters to the needs of the business.

Even if the company COO assigns several business people to the warehouse project team, there's still the risk of building too much or too little warehouse. Think about it: You wouldn't rent a hall that holds 200 people if you were expecting 500 revelers at your party; the same goes for your warehouse. CIOs can implement

their warehouses through a massive enterprisewide effort, a more manageable data mart or a combination approach. Just be sure to build a warehouse that can hold all your invitees without straining your budget.

As warehouse use takes off in a company, it's not surprising to find a few gate crashers from the outside. A retailer's distributors, for example, could probably benefit from accessing your company's inventory information, and in such situations, Web technology can be used to link disparate company platforms. Although the technology is young, Web access tools offer an intriguing new direction to warehouse growth and an inexpensive (if for the moment insecure) means for letting outsiders in.

All this may sound daunting, and indeed, a warehouse project presents singular challenges. But when designed properly, warehouses can produce astounding business paybacks, and IS may find itself the toast of the party.

Please read on as CIO delves into the various issues surrounding data warehouses; if you like what you read, visit our Data Warehouse Executive Resource Center at www.cio.com/CIO/rc_dw.html for additional information.

—Carol Hildebrand, Senior Writer

The Essential Guide

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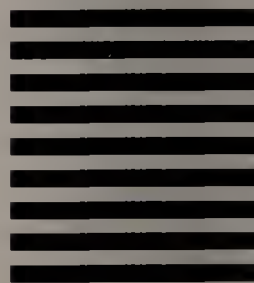
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Metric Systems *By E.B. Baatz*

UNDERSTANDING THE VALUE OF YOUR I.T. ACTIVITIES

Digesting the ROI Paradox

Return-on-investment figures are crucial, unless the new IT initiative is the boss's idea

LIVER WITH BACON and brussels sprouts. A problem that besets the typical CIO is a lot like the aftermath of that meal. One burning question keeps repeating: What is the ROI? What is the ROI? What is the ROI?

Of course, the fact that most information systems executives still report to the CFO explains why return-on-investment analyses preoccupy IS managers. The finance folks require payback periods, internal rates of return and net present values before they can take a single step.

Even contests like

CIO's own Enterprise Value Awards put a premium on ROI statistics.

But in the process of reporting on information technology over the past two years, one thing has become crystal clear to me. CIOs live and work in the presence of a troubling IT-world paradox. While the CIO's feet are continually being held to the ROI fire, once the CEO decides on a business-transforming IT investment, ROI calculations suddenly are no longer worth the time it takes to calculate them.

Consider how Roger McMennamy, CEO of Cooper Communities Inc. in Bella Vista, Ark., explained in 1994 why ROI never entered into his management decision to equip his sales force with PCs. "If we didn't think it was going to be profitable, we wouldn't be doing it," said McMennamy. "Ultimately, our measure of success will be the bottom line."

Or consider what Frank Barbee, manager of information technology for Phillips Petroleum Co. in Bartlesville, Okla., told me when I was researching a story. His comment about how his company decided to use enterprise resource planning software never made it into print. Barbee said, "We ask: 'Is it feasible?' We define costs, risks, manpower requirements. By October, we will have all the information we need to make the formal proposal. But we know we're going to do the project because the CEO said so."

Because the CEO said so.

Barbee and many of his peers are between the proverbial rock and hard place. The rock: the CEO, whose job often entails taking risks and not getting hung up on numbers. The hard place: how to attach numbers to the benefits an IT investment eventually might yield. A false step in either direction can leave the CIO with a bad case of heartburn.

When an IT purchase involves automating a manual process, tracking down numbers is easy. But when the moving target is the transformation of the business through technology, the ROI exercise seems at best a questionable use of precious time and at worst, well, stupid.

Think back to the CEOs who invested in automated teller machines in the 1980s. They couldn't justify their investments by measuring returns because for a long time there were no returns to measure, just costs. That put the ROI calculations into the scary negative zone that most bankers have trouble embracing. With hindsight,





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the bank CEOs who decided to invest in ATMs look smart. But they know in their executive hearts that luck played a crucial part.

Today, the decision to invest in data warehouses seems a lot like the ATM example, with CIOs scrambling to define the ROI and CEOs leaping without the data. It's obvious that "the opportunities to make huge amounts of money from deploying a data warehouse are clearly here," says Chris Horrocks, a senior partner with Computer Sciences Corp. who is responsible for CSC's data warehousing applications lab (see "Charting a Course," Page 46). In fact, some companies are enjoy-

**The better the relationship between
CIO and CEO, the less likely the IS team will be
shackled into trying to measure
how IT has transformed the business.**

ing such huge returns from their data warehouses, says Horrocks, that employees have been forbidden to talk about it to the press—or to anyone outside the company for that matter.

Indeed, when used as a strategic tool by upper management, the insights senior executives find in their data are astonishing and make critical differences in business decisions—about how to sell, to whom and at what price, or when to bail out and when to attack a new market. The ultimate ROI, if anyone were so enslaved by numbers to take the time and trouble to measure it, is astronomically high.

And yet IS executives continue to be force-fed the ROI meal. The only way out, says Horrocks, has nothing to do with numbers. It has to do with relationships. The better the relationship between CIO and CEO, the less likely the IS team will be shackled into trying to measure how IT has transformed the business.

THAT'S NOT TO SAY THAT ROI analyses should disappear completely. A well-timed, well-executed study that puts solid numbers around an IT trend can help slow down or even kill a technology fad better left untouched. Remember the days, not so long ago, when many a starry-eyed executive thought client/server was going to replace their legacy systems and save the company a bundle? Everybody in the IS department knew in their gut that this was baloney, but not until big-name market researchers like Gartner Group Inc. and Forrester Research Inc. published numbers did the fallacy die. Alternatively, a solid study may make it easier for the CEO to take that necessary leap without bugging the IS team to measure what will quickly be recognized as money well spent.

In the data warehousing arena, one such study making the rounds shows an average 401 percent three-year return on investment (see "Data Warehouse Dollar Data," this page). The astonishing numbers are compelling enough to make any CEO embark into the data warehousing venue without executing an exhaustive ROI analysis.

Regardless, CIOs will no doubt get saddled with the chore of concocting an ROI study for their next data warehouse project. But that's life in IS. It's up to the CIOs to digest the paradoxes that make their jobs so challenging—and to avoid having a plate of brussels sprouts with dinner. **CIO**

Senior Editor E.B. Baatz can be reached at ebaatz@cio.com.

Data Warehouse Dollar Data

*The ROI for implementing
a data warehouse can be
eye-popping*

IN LATE 1995 AND EARLY 1996, Stephen Graham, vice president of software research at International Data Corp. (Canada) Ltd., evaluated 62 organizations that had had a data warehouse up and running for at least six months. Excluding 17 exceptional cases, or what statisticians call "outliers," for which the ROI was either negative or above 2,000 percent, the average ROI for implementing a data warehouse over a three-year period was 401 percent. Including outliers incorporates an astonishing high ROI of 16,000 percent and a miserable low of -1,857 percent. More than 90 percent of those organizations in the statistically meaningful range reported a three-year ROI in excess of 40 percent, half reported returns of more than 160 percent and one-quarter reported ROI above 600 percent. The average three-year cost was \$2.3 million; the median payback period was 1.7 years.

Admittedly, the companies Graham studied were self-selected by vendors and IT professional services firms (which sponsored the study) and had to be willing to be identified, so the results are no doubt skewed upward. Some organizations, however, demonstrated extraordinary results, with ROI higher than 1,000 percent.

For metrics-hungry CIOs, the study is particularly useful not only for its 50-plus case studies but for its in-depth, easy-to-understand chapter entitled "ROI for the Rest of Us." It's a nice little primer on how to do ROI calculations, with a by-the-numbers example of exactly how Graham and his team crunched the figures for a typical data warehousing project.

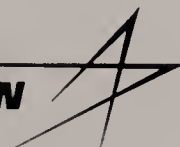
Parts of the study are available free from a number of the study sponsors' white papers. Or you can order the report for \$5,000 from IDC Canada by calling Cheryl Toffel at 800 343-4952, Ext. 4389. IDC is owned by International Data Group, the parent company of CIO Communications Inc. —E.B. Baatz

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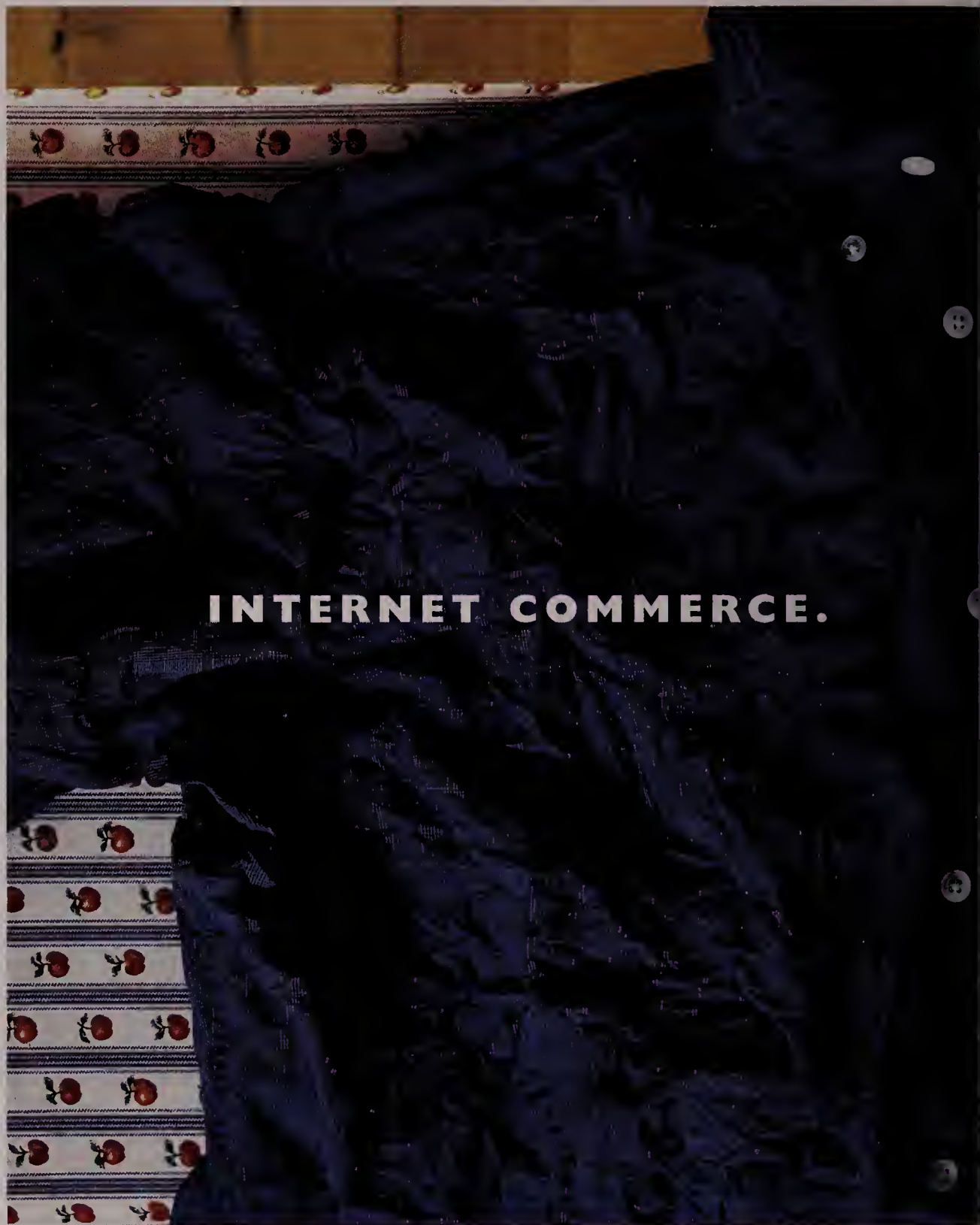
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Buried Treasure

Some dos and don'ts of data mining

BY ERICK BRETHENOUX

MERELY STORING information in a data warehouse does a company little good, no matter how neatly the data is stacked and organized. Getting information out of the warehouse is what allows organizations to reap the benefits of data warehousing, and data mining is one of the best ways to extract meaningful trends and patterns from a vast pile of data.

Although data mining is still in its infancy, companies in a wide range of industries—including retail, finance, health care, manufacturing, transportation and aerospace—are already using data mining tools and techniques to take advantage of historical data gathered internally or acquired from other organizations. By using pattern recognition technologies and statistical and mathematical techniques to sift through warehoused information, data mining helps analysts recognize significant facts, rela-

tionships, trends, patterns, exceptions and anomalies that might otherwise go unnoticed (see boxed examples). Companies also can use mining techniques to visualize the data, or present it in an easily digestible format, as well as to check for holes in the underlying data store.

The demands of data mining easily can overwhelm today's technology and products. Conventional mainframes seldom are able to run brute-force multiple queries on large data sets, and although the memory and processing power of many PCs and workstations are increasing, the available software is not always up to the task. Most analysis routines can handle only small samples of data at a time, making wide-ranging analysis difficult and time-consuming.

A methodical approach to data mining increases the chances of overcoming those barriers. Here are the main steps of Gartner Group Inc.'s data mining methodology:

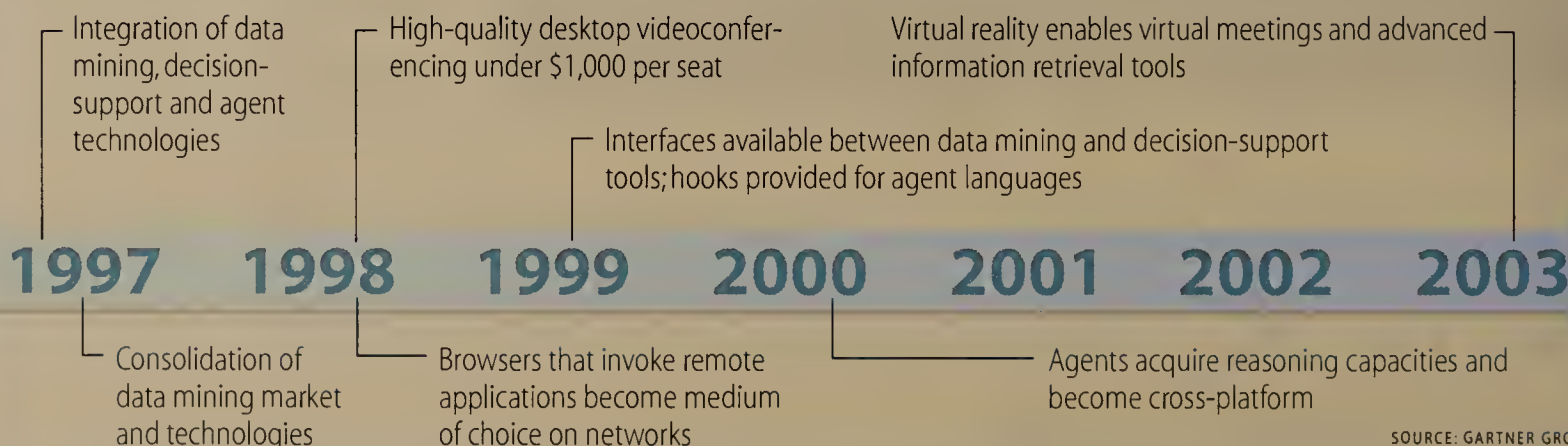
1. Database selection and preparation.

To mine data effectively, the warehouse must be set up properly. The first step is to identify the databases and factors to be explored. If possible, a live data dictionary should be created from which required records can be retrieved into the flat files needed by most analysis routines. The complexity of this step should not be underestimated: The databases of interest may be maintained by multiple departments, on various hardware platforms and operating systems, or in separate locations.

Data preparation involves filling in missing values and correcting errors. The referential integrity controls of modern relational databases have improved data quality, but legacy databases may be incomplete or full of errors. Interpolating missing data can be dangerous, particularly when dealing with small samples.

2. Clustering and feature analysis. The large database groups defined during the preparation phase are divided further using clustering techniques. That is followed by a more detailed feature analysis to find the factors that most obviously contribute to the formation of the clusters and to determine which factors are involved in attaining particular business goals. Clustering and feature analysis can pare down the prob-

Intelligent Decision-Support Tool Technology Timeline



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Gartner View

lem scope in terms of the number of factors or records to examine.

3. Tool selection. Many data mining tools are available, but most are incomplete and may have to be combined with techniques or systems already developed within an enterprise. Before acquiring a tool or a technology, Gartner Group recommends conducting a thorough analysis. Important questions that must be answered include the following:

■ *How many examples can be handled at once?* Even tools advertised as capable of handling large databases can't deal with amounts of data that exceed the computer's processing power and memory; that is especially true for PC-based products. That limitation is particularly important when analysts need to evaluate many factors because the number of examples the product can process may be insufficient.

■ *How much preprocessing is required?* Some high-level methods may process only discrete value ranges, which requires data preprocessing and normalization. In addition, data formats are an issue as some products process numeric input exclusively. Complete tools should come with database access, translation and preprocessing capabilities.

■ *Can the user express and test top-down hypotheses, or is the process only bottom-up?* Users should be able to substantiate hypotheses by testing them with specific facts or records (top-down analysis). The system also should be able to build hypotheses from individual facts while allowing users to modify the facts to perform what-if investigations (bottom-up analysis).

■ *Does the system generate rules, models, decision trees or numbers?* If an explanation of the results is the main goal, rules and induction techniques are appropriate. If finding the best combination of factors is the goal and a literal explanation is not required, neural networks and fractal techniques should be used.

■ *How easily can a data model be updated when new information is available?* Discovery tools should be able to process all data, no matter how often the data changes or how fast it enters the system. Systems that require long training or processing times may be inappropriate for organizations with rapidly changing data.

Real-Life Data Mining

Reading Between the Lines

By delving into its extensive customer-call database to manage its communications network, a regional telephone company identified new types of unmet customer needs. Using its data mining system, it discovered how to pinpoint prospects for additional services by measuring daily household usage for selected periods. For example, households that make many lengthy phone calls between 3 p.m. and 6 p.m. are likely to include teenagers, who are prime candidates for their own phones and lines. When the company used target marketing that emphasized convenience and value for adults—e.g., "Is the phone always tied up?"—hidden demand surfaced. Extensive telephone use between 9 a.m. and 5 p.m. characterized by patterns that clearly resemble voice, fax and modem usage suggests a customer has business activity. Target marketing offering those customers "business communications capabilities for small budgets" resulted in sales of additional lines, functions and equipment, both for the designated household and, surprisingly, for the remote offices occupied by members of that home.

A Matter of Degrees

For years, diesel fuel had been a significant expense for a U.S. rail freight company. Company policy called for keeping idle trains' engines running whenever the temperature dipped below 39 degrees Fahrenheit to prevent freeze-ups on northern routes. Consequently, many trains were left running when it was above freezing.

Using its data mining system, the company analyzed temperatures from the past two years along all traveled routes and determined that the policy was costing tens of millions of dollars. The analysis revealed patterns that provided the basis for dynamically matching temperature trends to freight routings, thus saving fuel—and money—without risking dangerous freeze-ups.

Mining for Gold Cards

The ability to accurately gauge customer response to changes in business rules is a powerful competitive advantage. A bank searching for new ways to increase revenues from its credit card operations tested a nonintuitive possibility: Would credit card usage and interest earned increase significantly if the bank halved its minimum required payment?

With hundreds of gigabytes of data representing two years of average credit card balances, payment amounts (e.g., minimum, full and varying ranges), payment timeliness, credit limit usage and other key parameters, the bank used a powerful data mining system to model the impact of the proposed policy change on specific customer categories, such as individuals consistently near or at their credit limits who make timely minimum or small payments. The bank discovered that cutting minimum payment requirements for small, targeted customer categories could increase average balances and extend indebtedness periods, generating more than \$25 million in additional interest earned.

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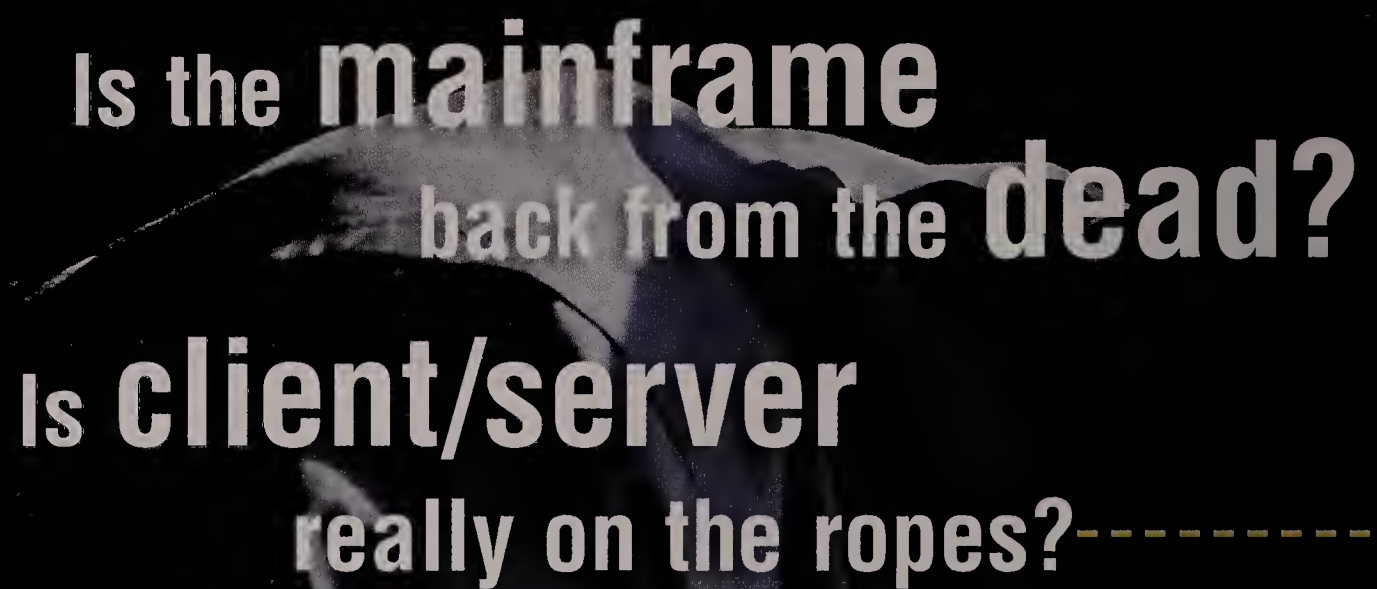
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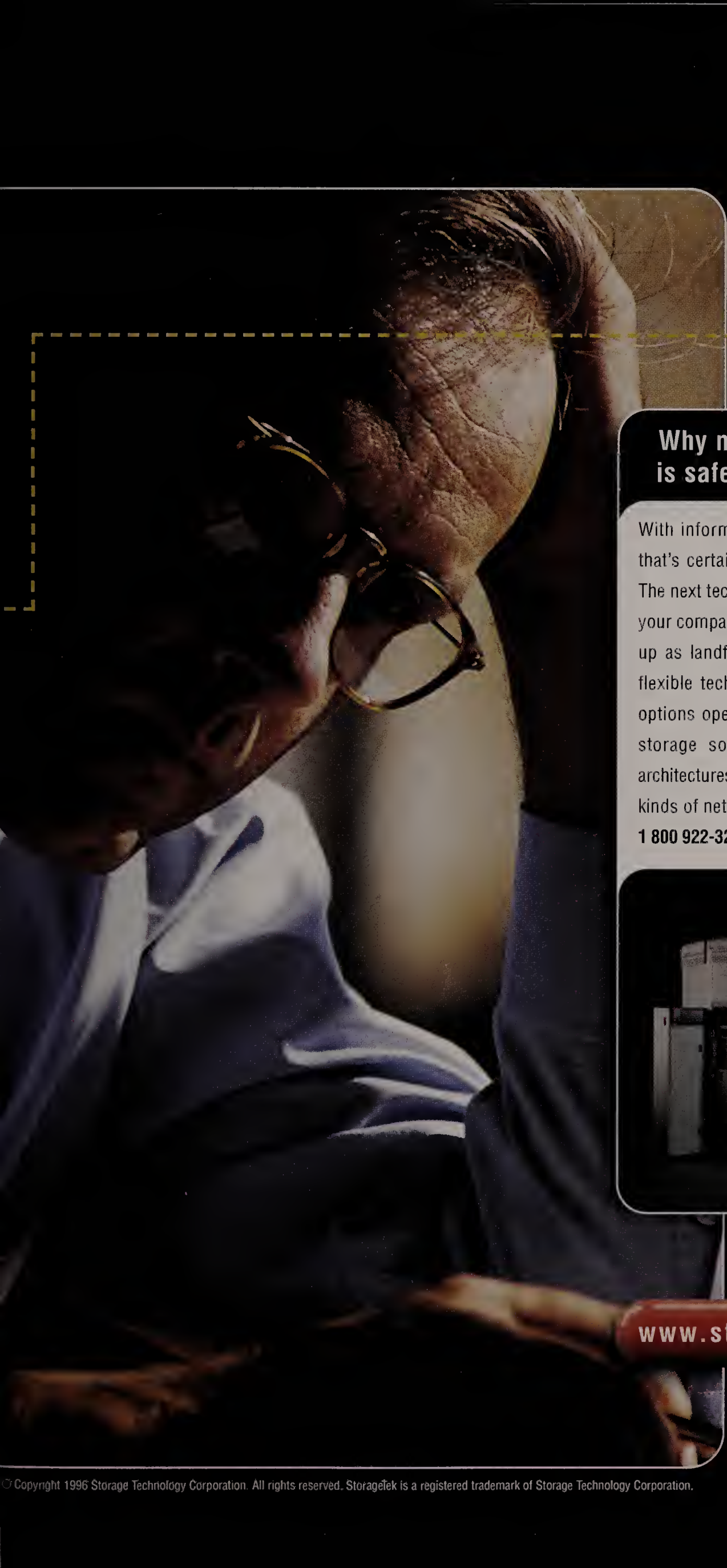
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Gartner View

■ *How much effort and expertise are required to use the technology?* Products range from highly automated tools that require few user adjustments to manual systems that demand considerable technical knowledge. The choice should be based on the skill levels of prospective users and developers as well as the complexity of the problem. In most cases, consulting expertise will be required.

4. Hypothesis testing and knowledge discovery. This step is most often associated with the term "data mining." During this process, hypotheses are formed and tested, new relationships are discovered and what-if analyses may be performed. Many issues come into play, such as sample size, processing time, complexity of the data and degree of confidence. The output of the data mining process depends on the product and technology used and often is in the form of rules, correlations, prediction models, relationship graphs or decision trees.

5. Knowledge application. In most cases, tested rules created from the discovery process can be added directly to either procedural code or—if there are many rules and updates are likely—into a knowledge-based system. Prediction models can often be integrated directly into application code, a particularly easy process with products that output their models in common languages such as C.

Data mining requires substantial human effort and interaction. The mechanisms for steering the process are still relatively new and are inadequate for dealing with the myriad factors and interactions in large data stores. Shrink-wrapped packages may promise enticing ease of use, but in many cases both technology-specific expertise and relevant domain knowledge are necessary.

Regardless of the technology underlying the data mining process, the value of discovered data—especially in retail marketing and finance—is time-sensitive. The first enterprises to exploit the data will have the upper hand in serving and attracting customers. **CIO**

Erick Brethenoux, research director of advanced technologies and applications at Gartner Group Inc., can be reached at 203 316-1111.

Real-Life Data Mining (Continued)

A Small Misunderstanding

Many companies have no idea who their customers are. Worse, some think they know but don't. A high-quality retail clothing company was justifiably concerned that its catalog for petite women's fashions was going nowhere—in fact, it looked like the fashions were unappealing to the targeted buyers. Having just implemented a data mining system for its inventory and sales data, the company turned to it to look at sales of petite women's clothing and relate that information to the catalog mailing lists.

The company discovered that many women requesting catalogs did not buy petite dresses. In fact, many of them wore larger-size dresses and ordered catalogs to follow the fashions of smaller women. As a result, the company redirected its catalogs to women who had previously ordered petite apparel. The shift produced a significant buying response and made the program a success.

The Sleepy Lumberjacks

Bed sales tend to slump in winter months, so when a large department store chain in the northwestern United States faced the prospect of an early winter, it decided to go on the offensive. After trying the usual mass-marketing approaches with minimal success, management turned to the company's data mining system to find out what else people shop for when they buy beds.

Summary statistical analysis of 15 months of sales data revealed nothing interesting. But detailed analysis showed one other item from the previous fall that seemed to correlate to sales of beds: chain saws. Management rejected this "spurious" finding until someone offered this explanation: In the fall, people buy chain saws to cut wood to heat their new mountain cabins for the winter. Many of them need beds as well. The company accepted the rationale and initiated a chain saw sales blitz as part of a winter cabin vacation promotion—complete with beds. Both items sold well above original expectations.

Albatross or Opportunity?

A major U.S. freight transportation company was offered an opportunity to buy a lot of shipping containers at a great price. But there was a catch: The company had to consummate the deal within 24 hours. Suspecting that the extra capacity could not be absorbed without upsetting growth plans, management decided to data mine its global-shipping database to see if expansion plans could take advantage of the shipping containers.

To their amazement, managers discovered that the company could make good use of the added capacity and concluded that the extra containers actually would accelerate expansion without taxing budgets—and save several million dollars in the process. One executive said the company would not have made the deal without the information obtained through data mining.

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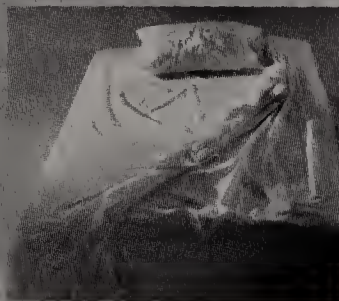
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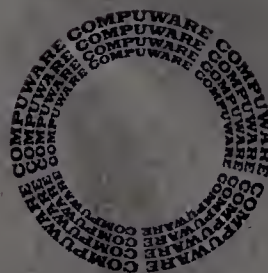
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“Nobody was talking about data marts back in 1990 when we started building our warehouse.”

—Julio Chavarria



Charting a Course

For many companies, plotting the growth and integration of discrete data marts must be weighed against taking a one-time plunge into an enterprisewide warehouse

BY JENNIFER BRESNAHAN



TO ATTRACT QUICK-HIT CUSTOMERS, merchants can slap together some plywood and cinder blocks to construct a convenience store. But to pull in big-time buyers, merchants know they will have to take the time, trouble and expense to build and stock a full-service food warehouse. Which is better? It depends upon the needs the merchant is trying to meet.

The same principle holds true for data warehousing. An organization looking to build a data warehouse must carefully balance its users' needs with its strategic goals before deciding on an enterprisewide warehouse or a fast, function-specific data mart. For companies interested in changing their corporate cultures or integrating separate departments, an enterprisewide approach makes sense. Companies that want a quick solution to a specific business problem are better served by a standalone data mart. And some companies opt to build a warehouse incrementally, data mart by data mart.

The stakes are not low. In the short term, enterprisewide warehouses do not yield the same ROI as data marts that address a specific business need. The average ROI of an enterprisewide warehouse is 321 percent, compared with 532 percent ROI from a smaller, task-specific warehouse, according to a survey conducted by Stephen Graham, vice president of software research with International Data Corp. Canada Ltd. (see "Data Warehouse Dollar Data," Page 34). (IDC is the sister company of CIO Communications Inc., both owned by International Data Group.) Yet in the long run, having access to all company data in one place without worrying about integration issues may be a better value.

Reader ROI

WHEN DECIDING BETWEEN BUILDING an expensive data warehouse or quickly adopting a data mart that may cause integration nightmares down the road, some CIOs conclude that the best course is to grow a warehouse piece by piece.

This article will assist with:

- ▶ understanding the pros and cons of enterprisewide data warehouses
- ▶ understanding the pros and cons of function-specific data marts
- ▶ avoiding data mart "anarchy"

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SYSTEMS PLANNING

ENTERPRISEWIDE WAREHOUSES

Until recently, companies haven't had much choice but to store information in the data warehouse equivalent of Sam's Club. Behemoth warehouses span the entire enterprise, allowing for cross-departmental queries on every level of detail. According to data mart vendor Informatica Corp., the average centralized data warehouse takes about three years to build and costs \$3 million to \$5 million. Containing terabytes of data, dozens of subject areas and potentially hundreds of geographically disparate users, large warehouses integrate data from across the organization, revealing trends that might not otherwise be apparent.

But since the sheer volume of data bogs down the system, warehouses can frustrate everyone involved. "The goal of a data warehouse is to provide knowledge workers with a consistent, integrated and summarized view of relevant data from all areas of the business and with external data from suppliers, market feeds and data clearinghouses," says Senior Consultant Wayne W. Eckerson of Boston-based consultancy Patricia Seybold Group. "However, creating and maintaining data warehouses is not easy. We know of many large data warehouse initiatives that have stalled or failed. The chief culprit is usually the size and scope of the initiative.... [And] unfortunately, multiyear, multimillion-dollar systems projects are no longer in vogue in corporate America." Chris Horrocks, a senior partner at Computer Sciences Corp. in Hanover, Md., agrees. He estimates that as many as 90 percent

ens of components from different vendors or to deal with the turf battles among users who must agree on a common set of semantics, definitions and business rules that are needed to define a data warehouse. Also, data warehouse projects can quickly get out of hand since it is difficult for IT managers to deny requests from business users and executive sponsors to change or expand the design, making it impossible to deliver systems on time and under budget."

Yet for companies looking to completely integrate or change their business processes from top to bottom, building an enterprisewide warehouse is a way to drive that change. Retail giant ShopKo Stores Inc., for instance, wanted to foster greater cross-functional collaboration. For years, the Green Bay, Wis.-based company's business divisions had each acted independently, basing decisions upon separate sets of data. That could cause problems if, for example, ShopKo's merchandising department sold 13 cartons of Product X, unaware that the distribution department usual-

"Data warehouse projects can get out of hand since it is difficult for IT managers to deny requests to change or expand the design, making it impossible to deliver systems on time and under budget."

—Wayne Eckerson

of warehouses failed to meet expectations in 1995, partly because they were too ambitious in scope and partly because they weren't targeted to make economic goals. Eckerson says, "Few IT shops have the expertise or stamina to integrate doz-

ly shipped 12 cartons of Product X at a time. "Our data warehouse was the biggest opportunity we'd had in 20 years to integrate all these functions," says Jim Tucker, senior vice president and CIO. "It's easy to break things apart but dif-

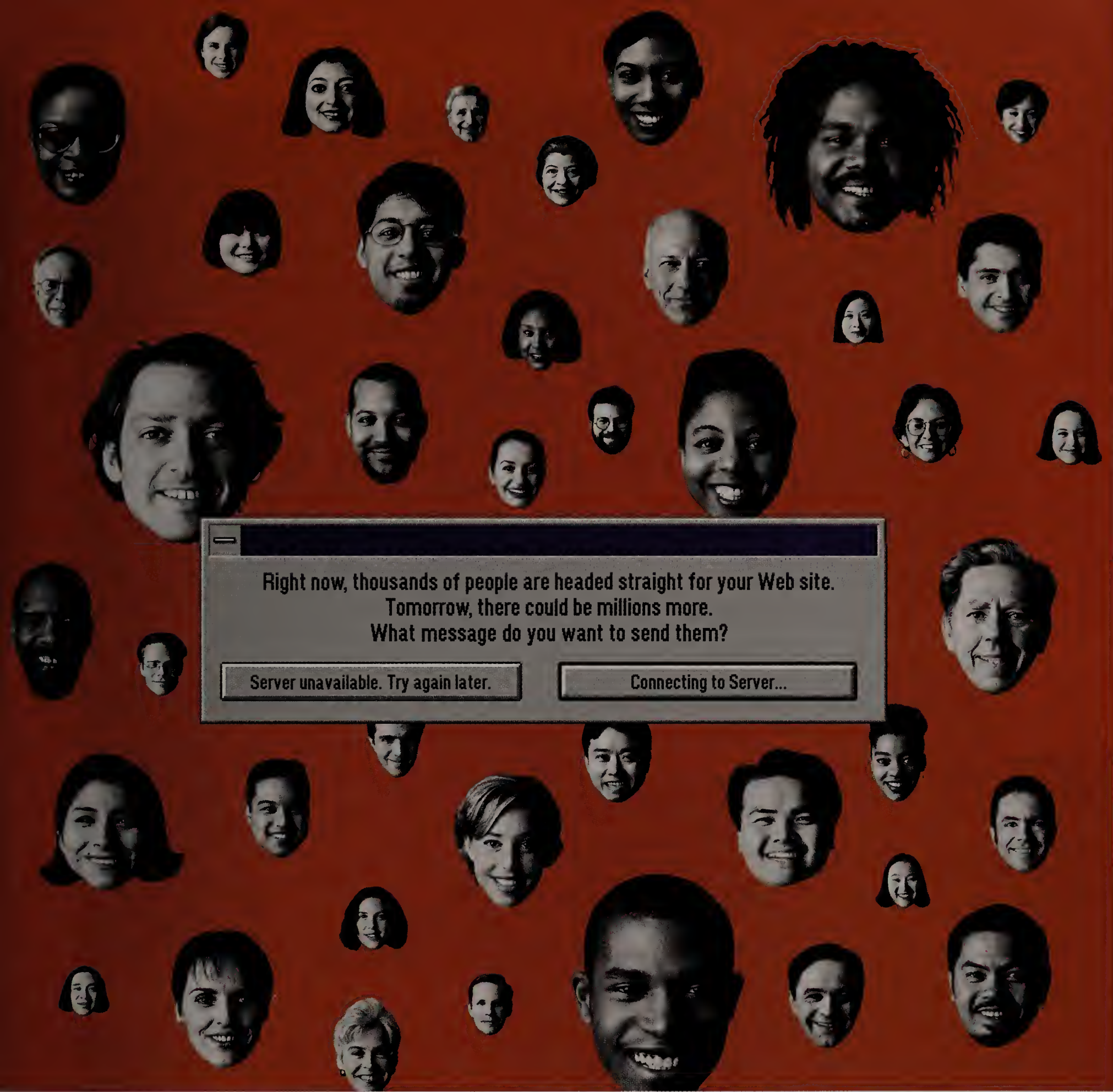
ficult to tie all the pieces together. Our problems are not in analyzing each individual area but in getting them to work as a big machine—a problem better suited to a warehouse than a data mart."

ShopKo had the advantage of already having a massively parallel processor in place, so it didn't have to invest in new hardware. The warehouse took about six months to build, using DSS Agent from MicroStrategy Inc. and data mining technology from IBM Corp. Now users in departments from merchandising, marketing and advertising are in sync and can analyze sales patterns and product usage.

Similarly, in 1994 a data warehouse was the key to integrating 10 separate hospitals—each with its own systems, procedures, personalities and opinions—into a new health-care network, Promina Health Systems of Atlanta (see "Form Follows Function," *CIO*, Nov. 1, 1995). Promina's CIO and vice president of information services, Bill Dotson, knew the best way to create a coherent whole was to build a central information repository. "With 10 hospitals and all the complications and politics, and everybody thinking they have the right solution, we felt from a corporate standpoint that the key ingredient

Michael Nelson wanted his department to remain independent.





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SYSTEMS PLANNING

to success was a good information systems infrastructure," says Dotson.

With the help of Systems Techniques Inc. (STI), an Atlanta-based consultancy, Dotson spoke with over 50 Promina employees in all disciplines to learn their information needs. "We didn't want something that was going to take two or three years to accomplish," says Dotson, "so we got people's consensus on what they wanted and needed first. That's why we were able to get it up as fast as we did."

The warehouse took nine months to build with an Oracle Corp.-based data warehousing model purchased from Metasystems Inc. Dotson and STI standardized definitions and coding. Promina's warehouse now culls information from many of its hospitals. Users in a broad range of jobs can draw comparisons, such as which doctor takes the most patients or which medical procedure is statistically more successful. "I figured if the warehouse is my backbone, I wanted to make sure I did the system right so that I did not have to go back

and redo it," says Dotson. "We were a young, integrated delivery system just forming and didn't have the opportunity to go for quick fixes."

tion from four or five data marts," he says. "I would still have to physically go to the places where the marts are kept to get that department's information."

"We needed to have a quick-hit success story before we could expect clients to fund further warehouse efforts."

—J. Chris Baker

Blue Cross & Blue Shield of Illinois, the health insurer based in Chicago, needed a way to bridge islands of information within different departments. "Nobody was talking about data marts back in 1990 when we started building our warehouse," says Julio Chavarria, Blue Cross's manager of the customer information service center. But now he wouldn't have it any other way. Blue Cross's lack of integration was a source of problems when situations out of the ordinary arose. For example, if a physician within the Blue Cross network

referred a member to a specialist outside the network, each department recorded the situation differently. The financial department coded the transaction as within the health-care network, charging the patient as if she had gone to a network doctor. The utilization department, however, coded the transaction as non-network because the doctor was an "outsider." During the year and a half it took to build its 370GB warehouse from NCR Corp., Blue Cross standardized coding systems and made sure the departments were in sync. Building separate data marts or a smaller warehouse wouldn't have

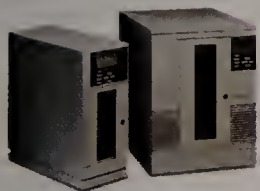
STANDALONE DATA MARTS

For companies less than eager to spend years and dollars on a data warehouse that might only be justified in the far-off future, a well-mannered, petite data mart makes more sense than a Goliath data warehouse. Mini data warehouses, or data marts, are fast and inexpensive to implement. Designed for individual business functions and small companies, they are ideal for quick adoption, though they aren't as robust as data warehouses. Typically, they contain fewer than 100GB of data and support 10 to 20 users. According to David Reiner, chief scientist and senior vice president of strategic development of database marketing consultancy Epsilon Data Management in Burlington, Mass., up to 80 percent of Epsilon's clients are now choosing standalone marketing information systems, or smaller data marts, over data warehouses. Cheaper and quicker, they download information more swiftly than a mainframe crammed with irrelevant information.

San Diego Gas & Electric is a prime example of an organization for which a data mart made sense. In the summer of 1995, J. Chris Baker, SDG&E's information management and security administration supervisor, needed to move fast to prevent the marketing department from buying its own, potentially incompatible data mart. Marketing needed a way to understand customer usage patterns—fast. Baker knew the marketing department could not wait for management to decide to invest in a mega data warehouse, so he went with a PowerMart data mart solution

solved the problem, says Chavarria. "Let's say I was going to pull informa-

Frank Pollard: Allstate dedicated 18 months to integrating all the data from 23 sites into a single warehouse.



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from Informatica that took three months to implement. He hoped that the single-function data mart would prove the value of data warehousing as well as prevent marketing from going in the wrong direction. "We needed to have a quick-hit success story before we could expect clients to fund further warehouse efforts," says Baker. Sure enough, other departments within SDG&E are now vying for their own data marts; next Baker will tackle the power plant and financial services department.

Unlike SDG&E, the IS department at San Antonio-based La Quinta Inns Inc., had no involvement in the company's first data mart. Michael Nelson, La Quinta's director of financial planning and budgeting, specifically wanted his department to remain independent. In the past, financial planning and budgeting had to rely upon IS to create budget reports from a mainframe-based system. If changes were made, it could take IS up to three days to generate new reports. Nelson wasn't concerned with protocol and compatibility issues; he just wanted a quick fix for the general ledger system. "There was no need for intervention from IS," explains Nelson. "If we could not get something solved, then we talked to Oracle's help line."

Nelson not only wanted independence, he wanted speed. In May 1994, his department decided it needed a tool by August. Nelson turned to Oracle's Financial Analyzer data mart. Six weeks later, the department had its data mart. Now users can look at financial information on one or all of La Quinta's 238 hotels, drilling down even to the cost of a continental breakfast on any given day. As they see what it can do, other departments are starting to eye the data mart, says Nelson. He speculates that each department will buy the same product from Oracle but that La Quinta's data marts will never be integrated into a single warehouse.

Unfortunately, data marts also have a downside. They don't hold as much data as warehouses. "When you start building data marts around departments, with big efforts going toward business-process reengineering, today the department exists, tomorrow it doesn't," points out Kevin Strange, research director at Gartner Group Inc. in San Jose, Calif. But the main drawback to data

Metaphysics of Meta Data

Meta data standards will enhance connectivity

Meta data is the unseen blueprint of a data warehouse. Just as DNA carries the entire genetic makeup of a person, meta data contains information on the creation and maintenance of a data warehouse, including hierarchical relationships, stored formulas, item descriptions, data sources, data update status, formatting information, currency conversion information, time series information, notes for reporting, security and access controls, availability of precalculated summary tables and data storage parameters.

And just as different blood types are incompatible, data warehouses with dissimilar meta data platforms just won't mix. Until now, every data warehousing vendor has had a different way to store and organize the meta data about a particular data warehouse or data mart. That is not a problem if a CIO monitors the birth and growth of the warehouse, making sure that all warehousing products and their meta data are based on the same platform. But if a CIO doesn't plan carefully, or if business units start buying incompatible data marts, a CIO is in deep trouble when it comes time to integrate the warehouse pieces into a whole. "Vendors would be doing consumers a disservice by saying that if you buy a bunch of different data marts, then there's no challenge down the road," says Randy Betancourt, program manager for data warehousing at SAS Institute Inc. in Cary, N.C. "A lot of organizations are trying to face and grapple with this problem, but nobody's got a lock on the solution yet."

Realizing that the problem could doom the scaleable data mart concept, five vendors and several consultants formed a coalition last year to develop a common protocol for meta data (the Meta Data Coalition can be reached at www.metadata.org).

The first warehousing products with the standard protocol should appear in 1997, but still it's not the "silver bullet," says Jane Griffin, president and CEO of Atlanta-based consultancy Systems Techniques Inc. and member of the Meta Data Coalition. "There's still going to have to be a lot of effort on the part of IS departments," she says. "Ultimately, integration is their responsibility."

Until a standard becomes, well, standard, Wayne W. Eckerson, a senior consultant with Boston-based consultancy Patricia Seybold Group, has identified the following strategies to help CIOs ensure that their warehouses can share meta data regardless of platforms:

Dispose and Replace: Convince individual business units to view their data marts as temporary fixes to be discarded once the company builds a data warehouse.

Mutual Exchange: Connect business units to corporate data only if they agree to certain terms, such as standardizing the use of business terms and formulas.

Physical Integration: Integrate heterogeneous data marts via a physical gateway that provides users with a unified view into multiple, geographically distributed data marts. This approach is sometimes called a "virtual data warehouse."

Logical Integration: Allow business units to build data marts using only a pre-defined set of semantics and rules after documenting shared definitions.

Grass-Roots Logical Integration: Adopt the data model and definitions of an initial group to build a data mart as a standard for all subsequent development, an approach that requires an evangelist to broker the activities of independent groups to make them see that working together is in their best interest.

—J. Bresnahan

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SYSTEMS PLANNING

marts is their inability to accommodate the inevitable "user creep."

INCREMENTAL BUILDING

As users begin to understand the potential of warehouses, they look for new ways to apply their knowledge. "You begin to realize that you can ask questions and get answers that you couldn't before," says Judy Scheffler, Lucent Technologies common applications vice president. "People start to think differently." The usual means of accommodating this cultural change is to build another data mart. Pretty soon, multiple data marts with incompatible architectures mushroom, leaving IS to clean up the mess and integrate stovepipe applications. "Companies that allow groups to build data marts willy-nilly are creating the legacy systems of tomorrow that will be just as costly to integrate as the legacy systems of today," says Eckerson. (See "Metaphysics of Meta Data," Page 54.)

That was the problem at Northbrook, Ill.-based Allstate Insurance Co. Prior to 1990, when CIO Frank Pollard first realized the company needed a centralized information hub, Allstate representatives from 23 sites around the United States collected and stored customer information in paper files from various vendors. Each lot of information was virtually inaccessible to the others. A car insurance representative in Miami waited weeks to obtain background information on a potential client from Boston. Worse yet, each state had a different coding system, so back office representatives had to manually compute the code for a

went away from." Now an Allstate agent can download information on a client from the company's warehouse while the client waits. But Pollard concedes that life would have been easier if the company had started with an enterprisewide warehouse from the get-go.

IS THERE A HAPPY MEDIUM?

With careful planning, data marts don't necessarily make an IS headache. Data mart "anarchy" can be avoided if the IS department keeps close tabs on all data warehousing activities to ensure compatibility with the organization's overall architecture, says Strange. If the same platform is used throughout, data marts can be scalable and integrated with other data marts to grow into a corporatewide warehouse. "It's a lot more work getting back to the starting gate than if you had a consistent approach all along," says Jane Griffin, president and CEO of STI. "CIOs have to convince the department to sacrifice short-term objectives for the longer-term objective of the enterprise."

Trey Bradley, senior vice president and CIO of Dallas-based cosmetics company Mary Kay Inc., has done just that. Mary Kay's first application, which took six months to build and contains 10GB

for marketing, financial, sales compensation and other systems. Bradley has kept a close watch on each step of the process since it began early this year. "I don't think this



Trey Bradley is planning the long-term growth of Mary Kay's data warehouse.

If the same platform is used throughout, data marts can be scalable and integrated with other data marts to grow into a corporatewide warehouse.

speeding violation from state to state.

Pollard and his IS team dedicated 18 months to integrate all the data into a single, large warehouse built with decision-support systems provider Acxiom Corp. "Nothing smaller would have sufficed," says Pollard. "That's what we

of data, enables sales agents to spot trends such as the skin cream preferences of 30-year-old women in the Midwest. As soon as Bradley is satisfied that there are no glitches in the sales-force application, he will give the OK to expand the same warehouse to include applications

system will get ahead of us because everything is happening through me," he says. "We'll keep with the same platform throughout."

Bradley wants the final warehouse to be completely user-friendly and able to address each user's needs. He also wants to remove IS completely from the daily workings of the warehouse. Bradley says that by growing a warehouse incrementally, "we have time to try another approach when we run into something the users don't understand or that doesn't work. The thing has no deadline, no ending date. It will always evolve."

Think of it: a functional, never-ending, growing warehouse—every CIO's fondest dream and worst nightmare. **CIO**

Staff Writer Jennifer Bresnahan can be reached at jennifer@cio.com.

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USER-CENTRIC DESIGN

Views You Can Use

CIOs intent on making data warehousing investments pay off must understand the user psyche. Because successful data warehouses are useful by design.

BY CAROL HILDEBRAND



THE I.S. FUNCTION IS HARDLY THE PROVINCE of James Bond and his brethren, but for Rogers Cantel Inc. sales executives to get their hands on a data warehouse, they had to call in the stealth programmers. The sales department hated the sales reporting system IS had delivered, says Simon Marwood, manager of sales operations development at Rogers Cantel, who spoke about executive information systems at a recent Decision Support Strategies conference in Cambridge, Mass. "Instead of EIS, everybody called it E-I-E-I-O," he says. "Nobody used it because the data was wrong." But systems folks were loath to change what they considered an acceptable system. So the vice president of sales and marketing at Rogers Cantel took matters into his own hands and hired Marwood and Frank Juhasz, ostensibly as sales representatives. Although the two do have business backgrounds, they were hired to do something besides schmooze with

clients and rack up sales. Marwood and Juhasz spent 14 months picking fellow sales staffers' brains and building a data warehouse that contains information on the North York, Ontario, telecommunications company's many different pricing schemes and tracks how each has performed. "We did it very much behind the scenes," says Juhasz. "It couldn't have happened any other way. And in the end, the project was wildly successful."

Surreptitiously building a warehouse may be a bit extreme, but the story illustrates a common problem with warehouse construction. Too many times, companies fail to turn transaction data into business data. A data warehouse should provide a business benefit, but unless the data within is couched in the business terms employees use daily, it is doomed to gather onscreen dust.

Reader ROI

CIOs WILL LEARN THE CRITICAL components of constructing a warehouse that meets user needs:

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- ▶ **Views**—create business-centric, flexible warehouse views

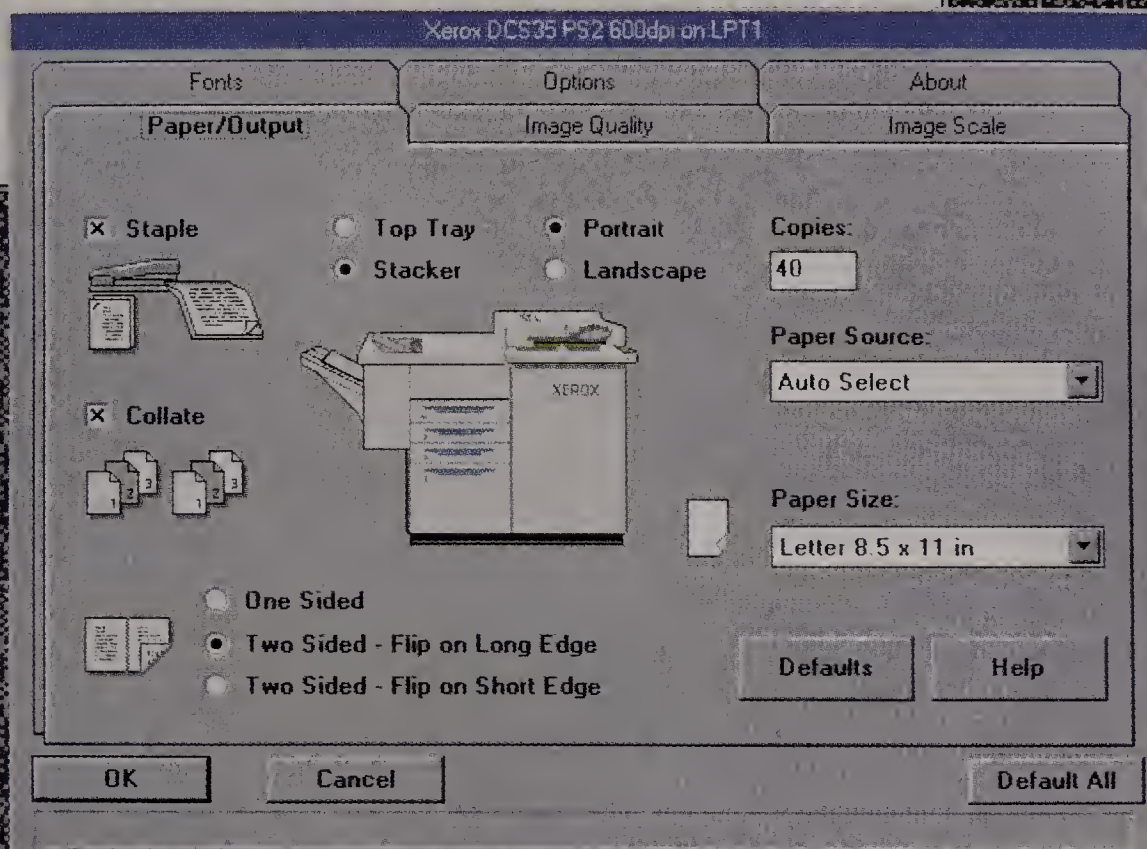


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By a WALL STREET JOURNAL Staff Reporter
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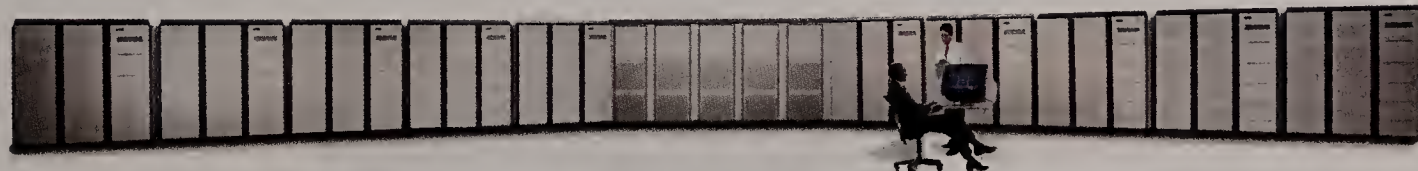
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Is this man really a sales rep?
FRANK JUHASZ was hired with that title, but his mandate from the sales department at Rogers Cantel was to help build a data warehouse that met users' business needs.

The best way to get users grabbing for the query tools is not just to populate a warehouse with every data point available to humankind but to do so with truly useful data that is easy to access. According to Mike Durbin, supervisor of information services in the finance department at Purina Mills Inc. in St. Louis, "to really get the benefits [of a warehouse], users should be using it themselves, not going down to the local expert. If that happens, you didn't do the warehouse correctly. You don't want a programmer for every department, and that's what will happen if you make the warehouse too hard to use."

Unfortunately, making a warehouse too hard to use is all too easy, and IS is often the culprit. Barbara Gaskin, a principal at Decision Support Technology

Inc., a data warehouse consultancy in Wellesley, Mass., points out that "if the system is pushed from an IS perspective, often they'll get the base level of information into a warehouse and will put access tools on top, but they'll miss applying a lot of business logic that users want. The data is all there, but not in the format users will need to analyze it." Consequently, IS folks on a data warehouse project should expect to find themselves working much more intimately than usual with the dreaded end-user community or, like the IS department at Rogers Cantel, sometimes even taking a

back seat in the proceedings (see "Who Should Build It?" Page 70).

Regardless of who leads the project, certain parts of the process are vital to building business logic into a warehouse.

Whether they're determining the economic payback of a warehouse, creating a data model for the warehouse or building user-centric data views, project teams must focus on providing business benefits rather than systems logic. If the project is done right, the result will produce the analytical nuggets that make data warehousing such a high-priority item in the first place.

CLARIFYING ECONOMIC OBJECTIVES

It seems pretty simple: Why the heck would any company want to build a system that won't make or save money?

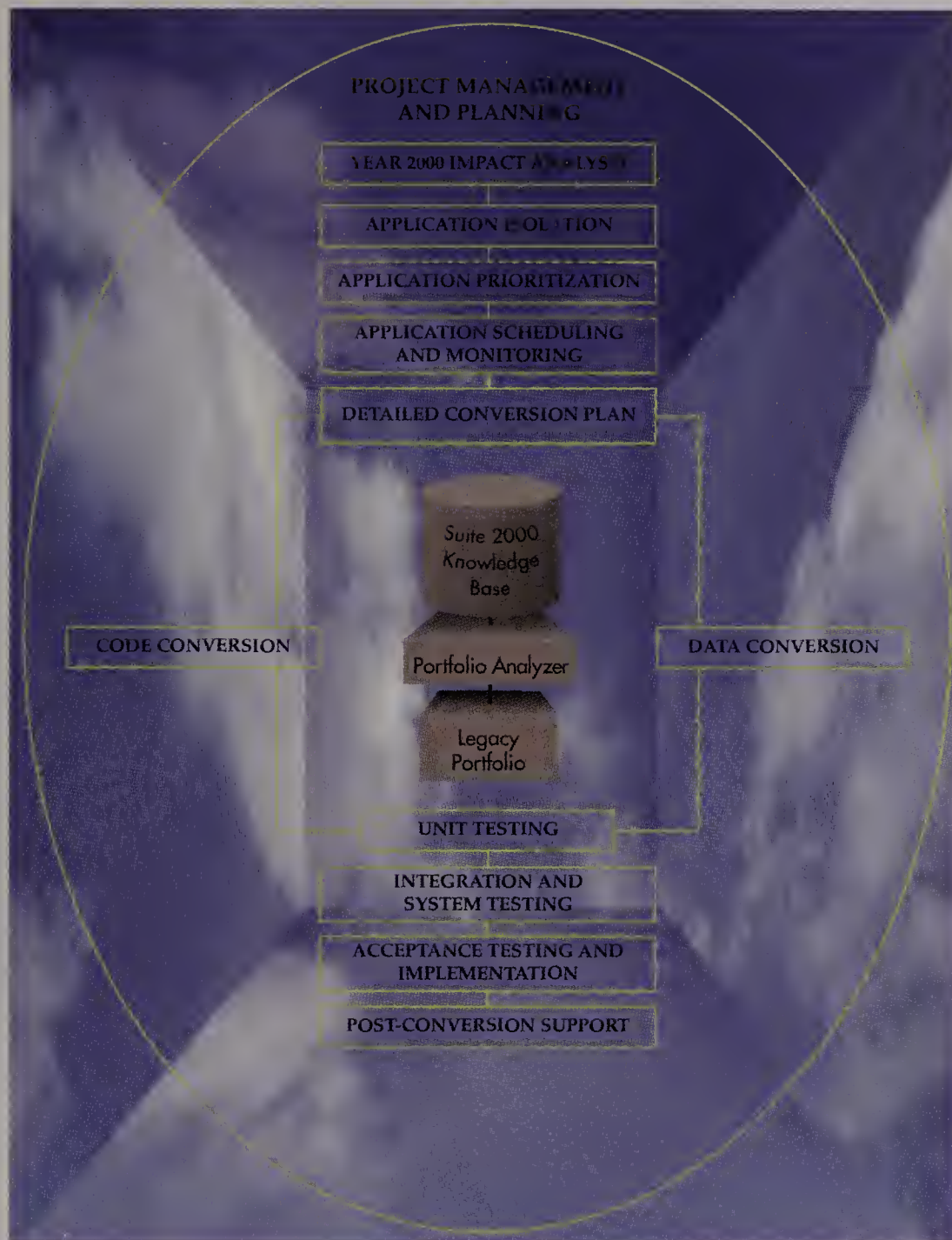
Surprisingly, they do it for any number of reasons—the corporate equivalent of keeping up with the Joneses, perhaps, or as an excuse to play with new technology. Consultant Chris Horrocks, a senior partner at the Hanover, Md., office of Computer Sciences Corp. (CSC), says he comes across the warehouse without a cause fairly often. Horrocks, who is responsible for CSC's data warehousing applications lab, tells the story of one company that spent two years building a very professional warehouse, beautifully sourced and extracted from the best legacy systems and partially populated. Then, he says, "the senior executive of the company called a [team] meeting and asked, 'But why did you do it?' It was a case of the cart before the horse." The bottom line, he says, is that a good warehouse will reduce operational costs and, more important, produce revenue.

To make sure that happens, project teams should research a company's business needs thoroughly and identify dis-

Although the warehouse without a cause is fairly common, a good warehouse should reduce operational costs and produce revenue.

crete economic benefits. "Merely having and accessing information in a warehouse is just an expense," says Evan Marks, vice president at Merck-Medco Managed Care Inc. in Montvale, N.J.

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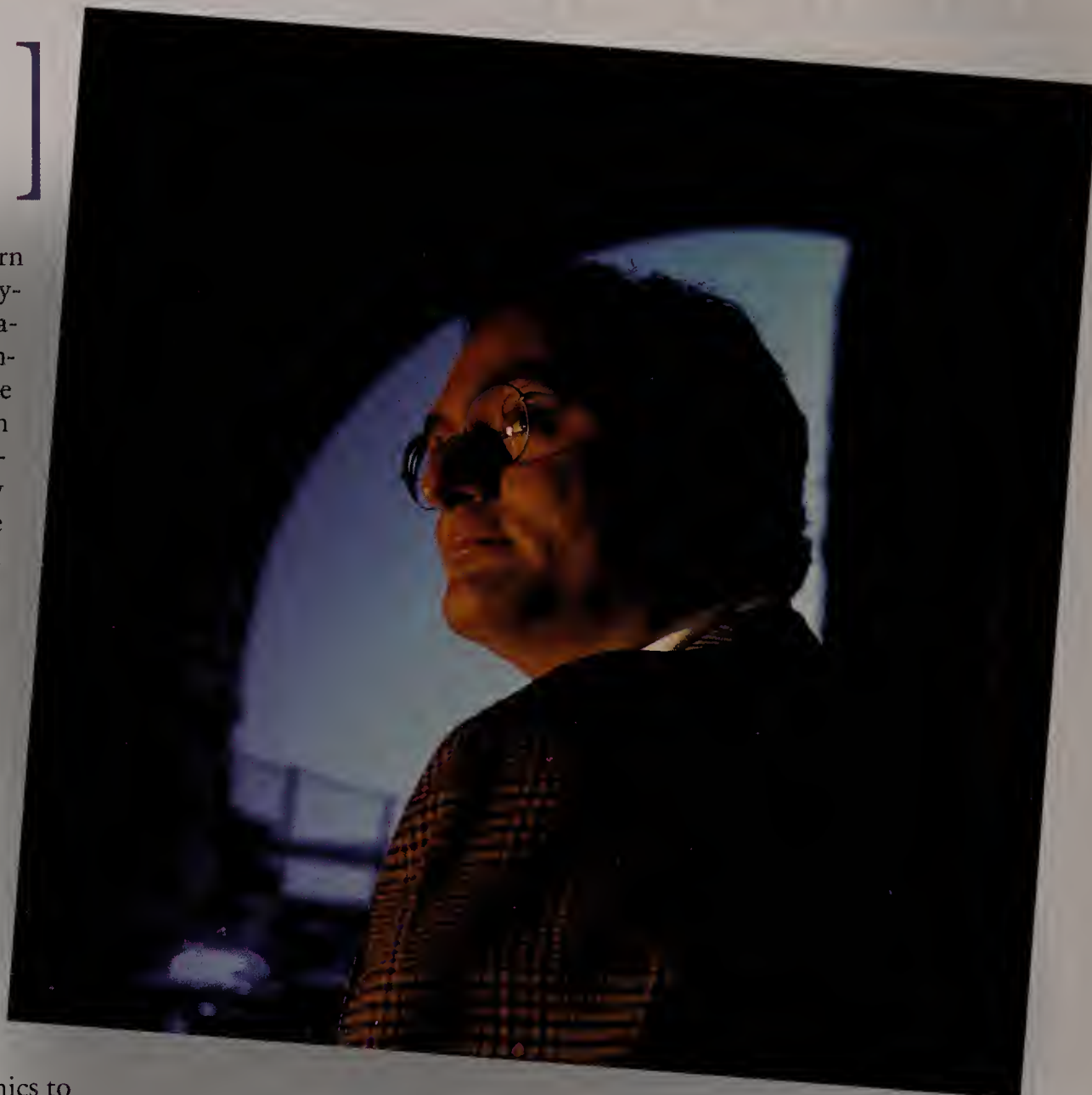
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Evan Marks: *"Merely having and accessing information in a warehouse is just an expense. Having applications that can turn information into value is the payback."*

"Having applications that can turn information into value is the payback." Merck-Medco, a pharmaceutical benefits management company, has collected nearly a terabyte of patient and claim information on its NCR Corp. Teradata data warehouse. Analysts help the company contain costs by evaluating the information to, for example, check for fraud or suggest lower-cost drug treatments. Merck-Medco's marketing division uses the warehouse to create new revenue streams by reducing costs to plan sponsors and beneficiaries. Marks explains that by tracking the demographics and behavioral patterns of customers, the company can pinpoint which groups would be most amenable to a particular advertising message or approach (direct mail versus telemarketing, for example). "By observing past behavior, we can use demographics to predict likely future behavior," he says.

The financial department at Hoffman Estates, Ill.-based Sears, Roebuck and Co. had similar goals for its data warehouse project. Stephen Beitler, senior director of financial processes and systems, says his group used its financial planning, reporting and forecasting warehouse (Essbase from Arbor Software Corp.) to cut costs and identify potential income opportunities. He reports that the system has already identified opportunities that



and individual store plans, sometimes paring as much as four months from the cycle. The revenue boosting isn't as cut-and-dried, says Beitler; it has been more a matter of the finance department searching the data for opportunities. "What if, for example, we have an analyst looking at data and asking, 'What would happen if we treated this tax differently for accounting purposes?'" Small questions like that can add up to big savings, he says.

"A data model is primarily a map of the data and the relationship between that piece of data and other pieces."

—James Kuhn

could boost revenue over the company's original projections by more than \$100 million. His group cut costs by reducing the time needed to create international planning reports, Sears' national budget

Horrocks points out that assigning clear economic expectations to a warehouse project not only defines the project better but also increases its chance for success because employees will be

more likely to use the stored information. "If the sales department has a mandate to generate \$5 million more in sales by using the warehouse, you bet they'll use it," he says.

DESIGNING DATA MODELS

Even if a company has painstakingly identified the economic benefits it expects from a warehouse, the effort will prove fruitless unless the data warehouse team builds a data model that allows the data to be easily organized, stored and retrieved. A data model basically outlines information sources and paths, helping the team understand exactly what kind of information business users need and where that information comes from. (Think of Hansel and Gretel and their crumbs of bread—a primitive data path.)

According to James L. Kuhn, IT systems manager of reengineering at United Services Automobile Association, an

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insurance company in San Antonio, "a data model is primarily a map of the data and the relationship between that piece of data and other pieces." Kuhn, who's involved in a multiyear cross-functional warehouse project at USAA, calls data modeling one of the critical issues of warehouse construction.

"One person knows where the data sources are but can't visualize their business use. The other person understands their potential usage but doesn't know what's there."

—Barbara Gaskin

But it's also one of the most contentious. First, line business employees must translate the instinctive analytical decisions they make into instructions that IS can use to code a logical path for the business data to follow. Second, IS must understand what the users are saying. Naturally, there are pitfalls on both sides of the process. The trouble is, says Gaskin, "one person knows where the data sources are but can't visualize their business use. The other person understands their potential usage but doesn't know what's there." The possibility for, shall we say, miscommunication, is obvious.

Jim Goehring, the regional controller at Purina Mills' Fort Worth, Texas, office, says the process involves a lot of "communicating back and forth about what kind of information truly means something to us." IS folks, he says, "aren't used to looking at information the way we in the field look at things." He cites financial reports that his department creates for upper management. The numbers are aggregates, he says, "and IS won't know all the bits and pieces that go into a particular number." If the data modelers don't know the data bits that make up one figure, they can't draw an electronic path that lets the smaller numbers feed the larger figure, and users won't get the information they need from the warehouse. "A lot of times, there may be one piece that doesn't get into that number [in the warehouse], and you have to go back and say you need to add it in," says Goehring. The problem is that fragments that make up the aggregate figure may reside in several different locations, and it takes

Who Should Build It?

Some users approach data warehouse construction with a do-it-yourself mentality. Others opt for a partnership between IS and business.

With all the emphasis on user involvement in data warehouse development, CIOs should not be astonished to find that many business users have ascended from project collaborators to project leaders. After all, a project with such business-intensive development needs might fare better in the hands of its ultimate users. Like the sales executive who hired Frank Juhasz and Simon Marwood to build a data warehouse at Rogers Cantel Inc., many business executives figure if they want it done right, they might as well do it themselves. Sears, Roebuck and Co.'s Stephen Beitler, whose warehouse runs about 450 concurrent ports to about 1,000 users, is another devotee of the all-user warehouse project. "The only time I want to see IS is if a user says, 'I would like to create this report, but there's no data point that maps to the data model,'" he says. He sees IS's role as one of maintaining and troubleshooting the legacy systems.

A recent International Data Corp. Canada Ltd. report, "The Foundations of Wisdom," supports the user-centric view. Upon examining the ROI of 62 different projects, IDC researchers found that 50 percent of a warehouse's ROI is derived from the user decisions and analyses drawn from warehouse information (rather than "harder" savings such as cost avoidance or efficiency). According to the report, "The influence of the user category is one of the elements that most differentiates the ROI of data warehousing from other technology projects." Although other projects can be driven successfully by IS alone, "these findings highlight the need for an organization building a warehouse to have the user community intimately involved," concludes author Stephen Graham. (IDC is a sister company of CIO Communications Inc.)

But other companies recognize a need for more equality between IS and business users. Although users are undoubtedly better able to define the requirements of a warehouse, they are less likely to be concerned with picking software and hardware that will conform to company standards and work across functions. In the USAA project, for example, both IS and end users devote themselves full time to the development of the project. Moreover, some of the IS folks have insurance accreditations, such as Chartered Property and Casualty Underwriter. "It helps me do a better job of living in both worlds," says James L. Kuhn, IT systems manager of reengineering at United Services Automobile Association. He adds that having both worlds working together on the project is even better, as it helps reduce IS scapegoating. "If this project goes into [use] and the users don't like it, I'd be in trouble, but so would somebody on the business side," he says.

—C. Hildebrand



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USER-CENTRIC DESIGN

a lot of talking for IS to understand the sources of users' information. "You need to be very open and patient," Goehring advises. "It sometimes can take six or seven tries to get the information right."

Small wonder, then, that users enter the modeling process reluctantly. "It can

rather than process transactions," he says, and systems folks have to adjust to that. "IS likes data that's neatly organized, normalized, with access control," says Griffin. "Data warehouses are kind of messy, and that can rock IS's boat. Is the data academically correct? No, but

data that don't belong anywhere," he says. "But data warehouses can have situations where referential integrity doesn't apply."

Griffin recommends that, once the project team has structured the data model, members perform queries on a prototype of it to see if it answers the kinds of questions users have.

In order to provide useful information, warehouses must also accurately reflect constantly changing business needs. "Systems people tend to think of data in static terms, even though our data needs change every day," says Beitler. Merck-Medco's Marks agrees. Users will need new data points mapped into the models as business requirements change, so "creating a flexible, generalized data model is key," he says. For example, when building its model, Marks says, his team wanted to add new

"Data warehouses are kind of messy, and that can rock IS's boat. Is the data academically correct? No, but it is correct in that it answers users' needs."

—Jane Griffin

be like pulling teeth to get users to tell you their needs," says Jane Griffin, president and CEO of Systems Techniques Inc. in Atlanta.

She recommends that the project team break the data into clusters of information that people need for their jobs. Then team members should sit down and deconstruct every cluster to the lowest level of granularity, deciding exactly what data is needed and how far back it should go. "Then the IS person has to go and ferret out what's there [in the source databases] and match it up. *Then* they have to validate this with users, asking, 'Is this what you wanted? How about this other stuff?'"

If it sounds like a giant pain in the patookus, it is. Beitler says his team rounded up 200 people and spent two weeks creating a data model for Sears' warehouse. It was tedious but worth it. "We had our CFO participating, which was extremely helpful," he says. "The exercise really gave us an understanding of what data points we needed to have."

But even if an entire roomful of users recite their needs with startling lucidity, IS has to face a few hurdles of its own. Many IS teams are used to building data models for transactional systems, the back-office systems that do the major data crunching for a company. But a data model for a warehouse is far different, says Kuhn. "You need to remap for a warehouse because it's a model designed to do queries

it is correct in that it answers users' needs." CSC's Horrocks agrees, saying that IS tends to worry too much about the referential integrity of a warehouse. It's not important for a warehouse to be set up so that each data detail is in sync at all times, he says. "In something like order entry, you shouldn't have bits of

Mike Durbin: "To really get the benefits of a warehouse, users should be using it themselves, not going down to the local expert."



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Stephen Beitler:

A financial planning, reporting and forecasting warehouse helped Sears identify opportunities that could boost revenue by more than \$100 million.

definitions into the model easily. So members spent a lot of time defining "what products are, what they have in common rather than how they are different." With a warehouse-wide common standard of definitions, the data model worked across different product and function lines.

CREATING RELEVANT VIEWS

After organizing the data to reflect user needs, a warehouse team must create data views that do the same thing. Perhaps more than any other part of the warehouse, the view belongs to the user community, says Griffin. "The views will change almost constantly," she explains. "Creating those linkages should be a joint responsibility [of IS and end users]."

Griffin says she tries to have what she calls a "business administrator" on-site during the warehouse development to analyze business needs and coordinate

with the IS point person, usually the database administrator, to help build the views. She calls it a "buffer and translator" job and says the description often translates to "thankless but necessary."

"Systems people tend to think of data in static terms, even though business data needs change every day."

—Stephen Beitler

"One of our frustrations is that we find we have really good mappers and data modelers, but they don't understand the business enough to translate [those models] into views," Griffin says. According to Gaskin, ideally systems should be simple enough that users can change views themselves, but she adds that "the reality is that most organizations are not willing to do that. It really should be the function of a business ana-

lyst to direct those kinds of changes."

Purina Mills' Durbin essentially serves that role. He can draw on three years of historical data from his time spent creating queries on a mainframe-based warehouse, but he builds views now that the 150 users of the company's new SAS Institute Inc. client/server warehouse can modify on the fly.

"It's easy to put the data in tables; it's pretty easy to maintain once you get automatic tools in there," he says. "The hard part is writing the applications to make sure anybody can use them." Durbin's users can modify the basic report window to refine their views as they need to. Because users' needs and preferences tend to vary, the ability to create a customized view is especially important. "If you create a view mechanism that

lets users do some picking and choosing, the individual won't have so many frustrations," says Griffin.

Unless a warehouse is both by the people and for the people, it runs the risk of failure. Such a maxim sounds deceptively simple, but plucking coherent

business requirements from users is even more challenging than churning code that rivals Astaire in elegance. As USAA's Kuhn puts it, "It's not important how technically neat it is. If users can't get the answer they want out of it, it just doesn't matter. So let's focus on what they need." **CIO**

Senior Writer Carol Hildebrand can be reached at cjh@cio.com.

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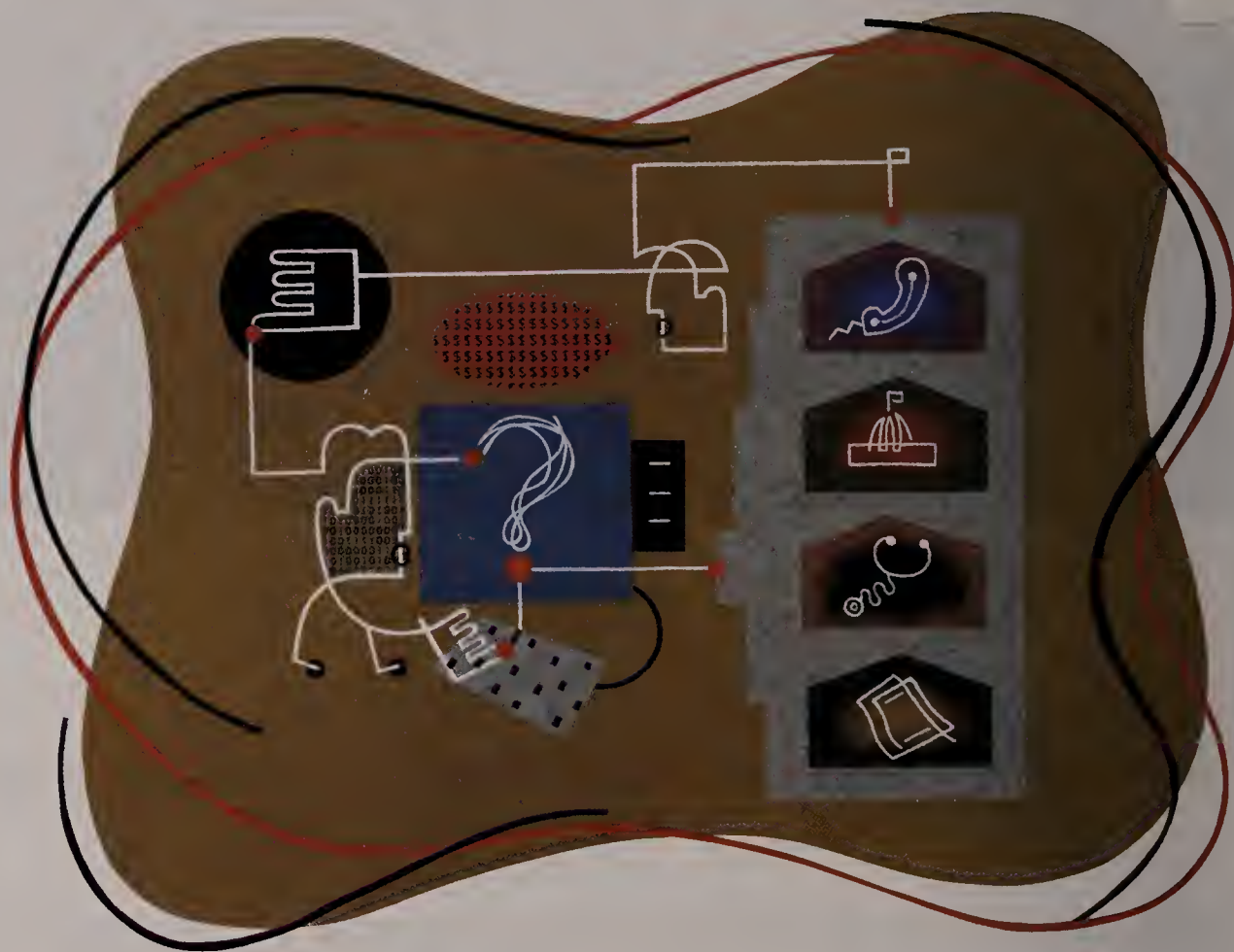


RETURN ON INVESTMENT

What's It Worth?

Experts from four diverse industries explore the measured, and immeasurable, benefits of data warehousing

BY E.B. BAATZ



W

HEN STEVEN GRAHAM began his trek to uncover the return on investment from data warehousing projects in 1995, he wasn't expecting an easy time of it. As it turned out, of the 21 organizations he visited, only one had even attempted to concoct a cost/benefit statement. "It was indicative of the fact that most data warehousing projects are started as skunkwork projects," says Graham, who is vice president of software research at



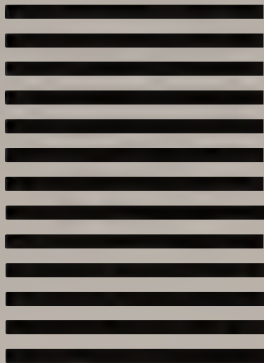
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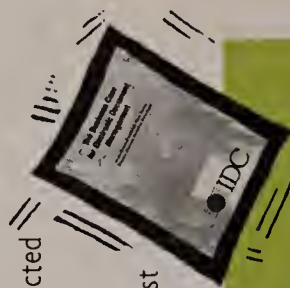
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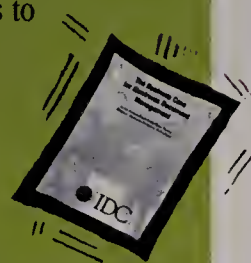
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International Data Corp. (Canada) Ltd. in Toronto. Early adopters of new technology rarely get caught up in the financial rigmarole.

Then Graham checked out the Gloucestershire Constabulary in England, and slowly, after interviews with information technologists as well as detectives and bobbies, he identified a clear 297 percent three-year ROI, even with some relatively harsh financial assumptions. And he knew his journey would not be in vain.

At the Gloucestershire Police Station, an emergency response system, a detailed crime reporting system, and an internal staff training and human resources database once operated independently, making the tedious task of uncovering trends in the diverse data harder still. It was clear that efficient and speedy use of data would mean criminals caught and lives saved—an immense but soft return on investment. But the cost of building a new transaction information system was prohibitive.

Using data warehouse technology to reach the same ends turned out to be much more affordable. When Graham added the savings from avoiding a costly transaction system to manpower savings from a more efficient operation, the hard-dollar return on investment suddenly became downright quantifiable. The “soft” benefits of enhancing public safety and saving lives were just icing on the cake.

The Constabulary example is not unique. CIOs facing the daunting task of measuring benefits of data warehousing projects can take heart: Of 45 organizations studied in depth by IDC Canada (which is owned by CIO’s parent company), the average three-year ROI for both enterprisewide and discrete data warehouses stood at a stunning 401 percent, and the average payback period was only 2.3 years. (For more

information on the IDC study on ROI, see “Data Warehouse Dollar Data,” Page 34.)

IS executives who set out to calculate warehousing benefits should follow a two-part process. To start, a straight justification based on the technology itself—hours saved in report writing, reduction in computer storage on the mainframe and other familiar metrics—will quickly yield results.

But to truly understand data warehousing investments, CIOs will also need to dig deeper to consider not just the features a warehouse provides but the effect the technology has on end users. “That means going to the users of the data warehouse to understand and attempt to quantify how the warehouse changed their jobs,” says Graham. “We looked at the effect of the warehouse on the data gatherers, the data keepers and the users, which meant we had to interview several different functions in the organization.”

CIO spoke with four data warehousing experts representing the telecommunications, government, insurance and health-care sectors. To hear them tell the tale, the impact of fingertip access to important data will truly be immeasurable—and in some cases perhaps even revolutionary.



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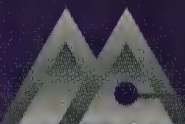
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Telecommunications

The Call to Customize

An interview with Ronald Loback, a 25-year veteran of the telecommunications industry and president and founder of Sage Communications Corp., an affiliate of BSG Corp., in Scottsdale, Ariz.

Are data warehouses behind all the pesky calls I get in the middle of dinner from telephone companies asking me to switch my service?

You bet. For example, the industry relies on data warehouses to target direct-mail campaigns. Rather than run traditional blanket mailings, telecommunications companies can target only 30,000 to 50,000 people with offers that meet their specific needs. The take rate—the number of people who actually buy—on the mailings has typically risen from 2 to 5 percent, with the average value of a “take” rising from \$3 to about \$5.50 per person.

AT&T and Bell Atlantic pioneered the use of warehouses in 1983 and 1984, building huge legacy systems that now hold terabytes of data. Why haven't we heard rumors of massive returns, as we have in the retail sector?

The monopolies were struggling initially because the data warehouses on the

legacy systems couldn't deliver an accurate picture of the customer. Their huge data warehouses became tremendously complex, with so much data that the users were unable to effectively utilize the information. The nature of the early architecture and access tools further complicated matters. One heard talk in the industry during the late '80s and early '90s of companies spending \$25 million to \$30 million on a data warehouse, only to see four to five users at the end of 20 months.

But they've had 10 years to work out the kinks. They must have something to show for their investments now.

Sure, but until recently, the data warehouses were so strategic that no one was talking about ROI. The first-tier telcos are in their second and third iterations of their warehouses now, adding call information and external data. And because the U.S. customer prospect lists have

been passed along

so many times, the telcos are starting to openly discuss the business payback. People in the industry talk about stimulating revenue generation in the 3 to 5 percent range as well as significantly reducing churn—the rate at which customers switch phone companies. They say they are getting payback on their new data warehouse investments now in eight to 14 months. But the more critical consideration is potential competitive parity and, in some cases, significant competitive advantage.

Is the market saturated now with fruitful data warehouses?

No, many have a lot of work yet to do, especially when it comes to understanding the calling patterns of each customer. The late arrivals to data warehousing

in the telco industry are doing everything in their power to push down the development time frame from the traditional 18 to 24 months to as quickly as nine to 12 months. Competition from private networks and lost revenues

are driving the trend toward warehousing.

What are the business benefits for telecommunications companies' investments in data warehousing today?

The industry is focusing on using its data to bring down the churn rates. With the base rate for acquiring a customer in the \$65 to \$160 range, decreasing the churn rate just a bit can result in big savings. Using their data warehouses to identify the profile of a potential churner, companies might then call customers who match that profile to thank them for choosing the service, which reduces the chances that they'll jump ship.

Where do you see a big payback for this technology in the future?

The industry will increase its investment by using marketing databases to cross-sell products. When a customer calls for information, the salesperson will be able to access the individual's customer profile in the warehouse. Then an artificial intelligence program will determine which other products are most likely to appeal to this customer and will feed a script to the sales rep. But the industry has a bit more work ahead of it before such scenarios become reality.



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—Harvard Business Review, September-October 1995

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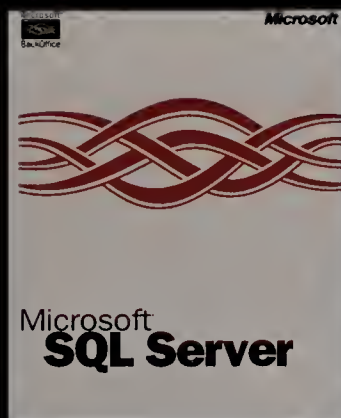


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Government

A Public Sector Revolution?

An interview with Ramon C. Barquin, president and founder of The Data Warehousing Institute and president of Barquin & Associates in Washington

In 1995, for the first time in more than a decade, the Massachusetts state budget was signed before the beginning of the fiscal year. Massachusetts' CIO Louis Gutierrez asserts that the warehouse system and the organizational processes it helped initiate were critical factors in improving the budget process. Is that typical of the benefits we see in government deployment of data warehouses?

Yes, as downsizing hits the public sector, government agencies are being asked to do the same amount of work—or more—with fewer people.

Many “rightsized” agencies are turning to data warehousing to help cope. Public sector data warehousing began to catch on at the state level in the early 1990s, in many cases driven by state comptrollers seeking a single view of the state budget. Because state legislatures hold the purse strings, comptrollers want ready access to the data so that they can respond more quickly to legislators' questions.

The Massachusetts system won The Data Warehousing Institute's best data warehouse contest in 1995, tying for first place with a private company. What was your reaction?

Quite frankly, I was surprised to see a government agency win. But according to the IDC study, the Massachusetts system had a 44 percent return on invest-

ment over three years, which is rather significant in the public sector.

How is cost justification of data warehousing different for government than for private companies?

In the private sector, companies delve into warehousing to enable things they couldn't do before; the big returns come from raising

revenues. In the

public sector, cost justification efforts focus on savings realized by the ware-

house. For example, the Naval Surface Warfare Center in Dahlgren, Va., justified its data warehouse by analyzing how much computer storage and paper costs the system would save. For the Wal-Marts and Sears of the world, this seems like a pretty trivial exercise. But for public agencies, which depend on cost-conscious state legislatures for budget approval, it's necessary. The fact that the Dahlgren data warehouse improves the center's ability to supply Navy officials with information on consolidations and downsizing was an added benefit, not a part of the original cost justification process. Other benefits—including increased service to the public, better accountability of agency activities and fraud detection—don't get measured in the cost savings calculations, but their value is obvious

Where will we see the biggest bang for the buck in the public sector?

Although most of the investments now have been in the comptrollers' offices, we'll see big benefits from the use of data warehousing technology in law enforcement, health care and management of social programs. In the Medicare and Medicaid programs, for example, data warehousing techniques could yield tremendous benefits in our understanding of health-care economics and efficacy of medical treatments. The Health Care Finance Administration is already exploring this.

You've said that data warehousing can revolutionize government. Why?

Consider the mess in which state governments find themselves. Lots of different laws and mandates come down from the federal level with agencies like the Department of Agriculture overseeing food stamps, Housing and Urban Development setting low-income housing programs, and Health and Human Services establishing health-care programs. But to measure their combined impact on welfare policy, the government needs an integrated view of all social programs. With data warehousing, the government will be able to fix the welfare system.

Governments are probably stewards of the largest amounts of data and information around. With data warehousing, the potential for government to revolutionize the services it provides is huge. The result, if we do it right, could make private sector ROI figures pale by comparison.



DATABASICS:

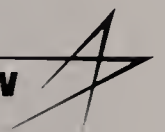
At the Naval Surface Warfare Center, past efforts to obtain project data could require a team of analysts to access several databases and struggle with diverse formats, multiple definitions and varying degrees of timeliness for the same basic information. In September 1991, the center launched a data warehousing project. Today, loaded with data from 30 different sources and already up to 12GB—12 billion characters of information—the warehouse serves 700 users in Virginia, Maryland and Florida.

—Government Executive, May 1995

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Insurance

Strategizing for the Future

An interview with Thomas Chesbrough, president and CEO of Kapstone Systems Inc. of Kansas City, Mo., and a leader in the effort to build and implement one of the first comprehensive data warehouses in the insurance industry

Which companies have led the way in data warehousing in the insurance industry, and how assiduous have they been about tracking cost/benefits?

Large insurers like Aetna Life Insurance Co. and The Travelers Insurance Co. have been the leaders. In the early days, of course, the costs were extremely high, so tracking returns was important. For example, Travelers launched its data warehouse in 1990, and for the first year of operation, the IS group did a cost/benefit analysis on every information request to make sure the warehouse was worth the investment. But it didn't

take long to see the payback. The company was able to separate the costs of underinsured motorists from losses incurred by uninsured motorists. Before the warehouse, that kind of analysis was difficult to do. After the warehouse, Travelers was able to argue to the state insurance regulators for a price hike for underinsured motorists based on the actual loss costs, generating hundreds of thousands of dollars in additional premiums.

Now that client/server systems and data marts have lowered the cost of warehousing, is the insurance industry still focused on measuring returns?

I don't think so. Demand for data warehouses from smaller companies is exploding. There has been a lot of pent-up frustration. Management access to information has been a big problem, with the mainframe systems hard to access and requests for reports taking weeks for IS to fulfill. Now insurance

executives are turning to IS and demanding data warehouses without focusing on measuring returns.

Any examples of how these recent data warehousing devotees are garnering business benefits from their investments?

In general, insurers are using data warehousing technology to get a better handle on their pricing mechanisms, uncover fraud, and profile and retain their most profitable customers. One small company in Kansas City, for example, has built a data mart from its enterprise-wide data warehouse that uses a sophisticated pricing model to look at all the key characteristics of its commercial business. With the ability to look at profitability in detail, the company can more readily determine how low it can go in pricing when a new competitor enters the market. The prospect of millions of dollars in potential revenues made the company's data warehouse easy to justify.

Soft benefits, like speedier access to data and more accurate data, are also often cited by IS folks as a justification for data warehousing investments. Are insurance companies,

those collectors of huge databases, vocal about this, too?

Yes, although no one can put a dollar figure on it, the accuracy of data stands out as a primary benefit of data warehousing in the insurance industry. A manager asking how much business has been written might get an answer of \$30 million from one system and \$42 million from another. Well, which is right? Even if the IS department has good explanations for the differences in the reports, the

confusion would paralyze the business. Data warehousing, which forces

companies to grapple with the discrepancies in their data and to standardize the information so that the manager can make timely decisions, is solving this problem.

More accurate data is great, but what's the most compelling cost/benefit case for data warehousing in the insurance industry?

Insurance companies are justifying their warehouse investments in terms of increased productivity and lower costs, but it's the strategic benefits—such as the ability to analyze pricing strategies or to identify and nurture the customers with the most potential—that are delivering 1,000 percent or more ROI. Although the returns are impressive, you won't hear much about them. No one in the insurance industry wants to reveal their strategic weapons.



DATABASICS:

An insurance company with 75,000 policies, six field reps and five product lines in 15 states would generate a report with 121.5 billion numbers a month. The only thing that the technology of the 1980s did was overwhelm the business people. Data warehousing, combined with intelligent agents, promise to get people out from under the mountains of data.

—Thomas Chesbrough, Kapstone Systems Inc.

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Health Care

Survival of the Fittest

An interview with Kerry Stover, a Dallas-based partner in Andersen Consulting's health-care industry practice, with a decade of experience in data warehousing

In the health-care market, the shift from a fee-for-service to a managed-care environment has dramatically altered the landscape. Are data warehouses helping to control costs?

Yes, health-care companies are using data warehousing techniques to manage the financial side of the business—with big benefits. For example, as a result of analysis made possible by data warehouses, Voluntary Hospitals Association members have reported yearly cost savings ranging from several thousands of dollars to more than \$1 million.

Using data warehousing techniques to manage financials is fairly mundane these days. Is the health-care industry pushing the technology to new uses?

Data warehousing as an enterprisewide concept is fairly new. Health-care companies have begun integrating financial and clinical data in order to understand which treatments work best and are most cost-effective. To do that, they're building clinical data repositories in which to store information

about each patient visit. Such warehouses are tremendously difficult to build because the industry tends to use packaged software, and there are hundreds of vendors with hundreds of thousands of data models. A single industry standard does not exist.

How are companies measuring the benefits of such efforts?

Payback is not immediately apparent from those projects. The scale of those data warehouses needs to be very large. Health-care providers need to monitor a large number of patients over an extended time period in order for the data analysis to be statistically accurate. In fact, the payback may take as long as three to four years. Small

hospitals that can't afford the investments are struggling with the payback question. But for large health-care providers, such as \$17 billion Columbia/HCA Healthcare Corp. with more than 300 hospitals, the clinical data warehouse makes sense. They can build the warehouse once, standardize the systems and replicate its use across multiple hospitals, outpatient centers and other health organizations.

Is the impetus for these complex clinical data warehouses coming from payers like insurance companies?

Yes, managed-care orga-

nizations and insurance companies have been dictating the terms of the protocols for patient treatment with a focus on keeping costs down. But now the CEOs and medical directors of the health-care provider companies are using data to challenge insurers' refusals to pay for "unnecessary" services. The integrated doctor organizations will build data warehouses so that they have the necessary data to defend their treat-

ments. They want to be able to prove, for example, that they treat more overweight

patients than other doctor groups, and thus their fees must be higher than insurers think they should be.

Nonetheless, a three- to four-year payback period on these complex clinical data warehouses is a long time. What's driving caretakers to take the risk?

Warehousing clinical data may have such big returns for the health-care industry that the organizations that make the best investments in data warehousing will have a significant competitive advantage and will beat all comers. In fact, by the year 2000, Andersen expects the convergence in the managed-care industry will result in the emergence of about five dominant national managed-care firms. And you can bet that all of the survivors will have data warehouses. **CIO**

Senior Editor E.B. Baatz can be reached at ebaatz@cio.com.



DATABASICS:

United Healthcare used its data warehouse to analyze why its costs were too high and found, to its surprise, that it had only a 70 percent immunization rate. By increasing immunization rates and thereby decreasing the incidence of disease, the company was able to reduce costs. But not until the data warehouse revealed the problem did the solution become apparent.

—Kerry Stover, Andersen Consulting

One HMO studied invested \$3.2 million in warehousing hardware and systems software and an additional \$1 million in labor and consulting. A manual review of a small subset of the data showed an expected \$35 million in short-term benefits. That provided a predictable ROI of 600 percent within two years.

—Evan Bauer, Giga Information Group

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Daniel Greenberg at ACNielsen is looking to the integration of the Web and warehousing for market research and information delivery.



Just Browsing, Thanks

Web access to a data warehouse is a tempting innovation, but uncertainties of the Internet call for caution before opening the store to all comers

BY HEATH ROW

L

EONARD LUCKLESS, A ROAD WARRIOR for Illstar Inc. of Erehwon, N.J., carries a laptop but has to call a support team for up-to-the minute data while traveling. Unable to access Illstar's monster data warehouse himself, Leonard often has to wait several hours—sometimes overnight—to get the information he needs for critical sales calls. Today, a hot prospect is ready to sign, but the data he requires to seal the deal is nestled away in the IT innards of corporate headquarters. Seeing that the data is not quickly forthcoming, the hot prospect balks and Leonard loses the contract.

If Illstar's data warehouse had been integrated with the World Wide Web, Leonard might have had the information on his laptop instantly, saving his company the sale and earning himself a substantial bonus. Too bad for Leonard.

During the first half of 1996, many major data warehouse vendors announced or released Web integration products. Smaller companies, some still reeling from their entry into the client/server decision-support systems (DSS) market, are scrambling to keep up. The face of data warehousing is changing, and companies with large data stores are contemplating opening their warehouses to outside customers, business partners and even consumers in an attempt to make corporate data a profit center outside of day-to-day business use. If someone will pay a handful of digital cash to compare pretzel prices before trekking to the store, a company with the right kind of data is sure to rake in the take.

DIPPING IN A REVENUE STREAM

Cultivating a company's data stores as a revenue stream outside IS is still a new concept, but Web warehousing promises benefits that are the givens of the Web itself. By using the Web as a platform for information access, for example, IS departments can deploy and

Reader ROI

INTEGRATING DATA WAREHOUSES with the World Wide Web promises ease of access and the potential for new revenue sources. This article explains the trade-offs between increased access and corporate security and the resulting cost benefits when opening a data warehouse to the Web.

maintain data warehouse access tools cheaply and easily. For another, companies can decrease customer and client support costs by opening data warehouses to users over the Web. Robert R.

with Visual Basic from Microsoft Corp. In spring 1996, Fidelity built a system that draws on a small data mart for a select group of high-level executives who want snapshot reports of the company's

The Web is not yet a wonder drug for data warehouse access.

Glass, director of MIS for ChemTreat of Richmond, Va., says the water-treatment-formula developer's customer service department receives over 300 calls a week for warehoused sales information. By making the information available via the Web, ChemTreat hopes to free up the staff person currently fielding those sales requests.

Nevertheless, the full payback potential for Web warehousing is yet to come. Once ChemTreat finishes testing its VMark Software Inc.'s HyperStar-based interface and UVWeb Web interface with 20 users across the United States, the company will wait to see how the technology improves, Glass says.

It's a promising future, but the Web is not yet a wonder drug for data warehouse access. Steve Cranford, a partner in charge of KPMG Peat Marwick LLP's data warehousing practice and strategic services consulting, says the industry should hit its stride by the end of next year. Having worked with data warehouse Web tools from Information Advantage, MicroStrategy, SAS, Arbor and Oracle, Cranford says many tools lack security and functionality because of the hypertext markup language interface and bandwidth limitations of the Internet. Solution providers will be able to add needed functionality—such as the drag-and-drop utility of client/server applications—in the future, he adds. "Coming through the Web and through the firewalls, the products just aren't robust enough to handle more dynamic querying," he says. "A lot of custom development has to be done to make it worthwhile and not a toy."

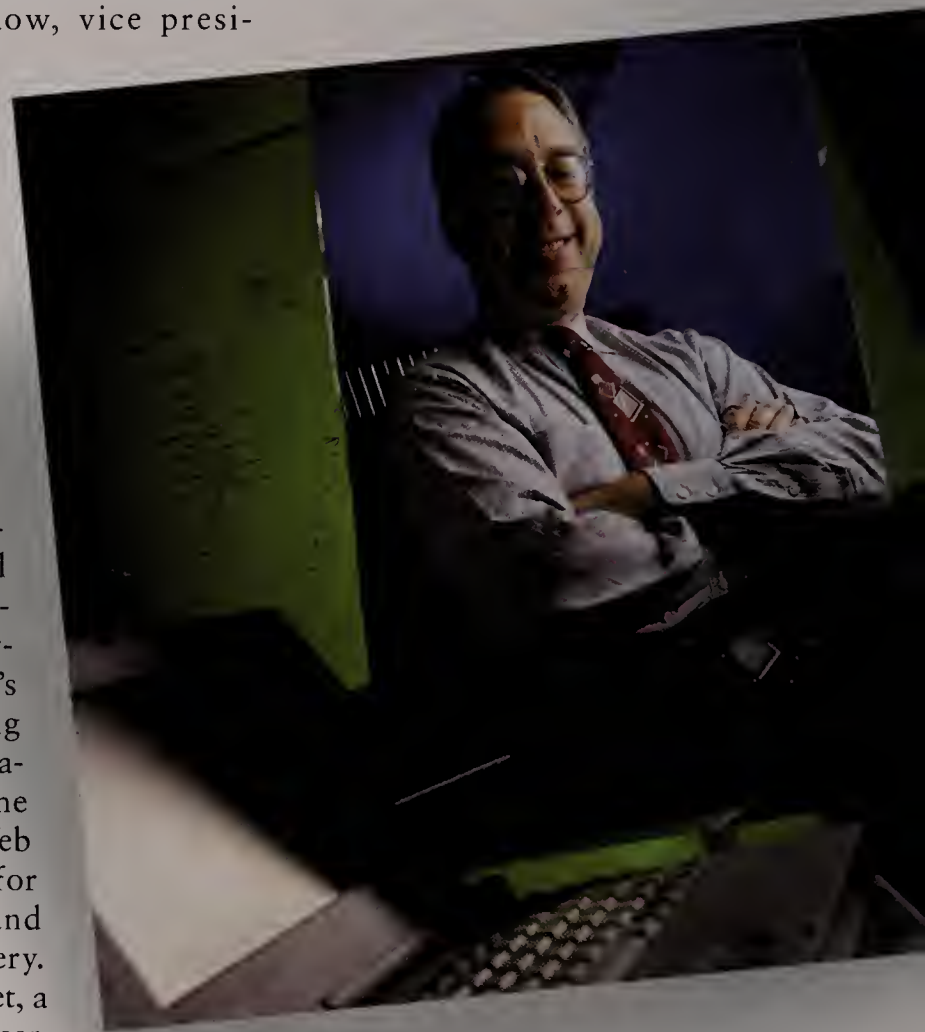
Until then, many companies will work around the lesser functionality inherent in Web integration. Fidelity Investments of Boston designed an information management system modeled on the Web by using HTML but using a browser built

with Visual Basic from Microsoft Corp. Though no existing Web integration tool matched Fidelity's needs for the reports' presentation and content, the company used Web conventions so that adjustments would be minimal when the technology improved. "We wanted to use HTML as much as possible," says Steve Rubinow, vice president of Fidelity's corporate MIS. "If you're going to do something on the Web, you might as well do it and not do it halfway as we had to then."

ACNielsen Co. Inc. of Schaumburg, Ill., hopes to consumerize data—all the way. Daniel Greenberg, vice president of Internet services for ACNielsen's global marketing group, says the company is looking to the integration of the Web and warehousing for market research and information delivery. ACNielsen's SalesNet, a subscription-based service for consumer packaged-goods producers and retailers, offers Internet access to thousands of specialized databases. They contain information from more than 800 retailers as well as information on the buying habits of 40,000 U.S. households representing the grocery-shopping public. Salespeople from ACNielsen's 600 U.S. clients and more than 9,000 international partners in 93 countries can access the service via the Web.

Greenberg says salespeople use SalesNet to download reports that include analysis of what might otherwise be just data dumps. Although users of remote, thin clients might not be able to access the analysis tools available to desktop users of a client/server DSS setup, a Web interface can make data and analyses available quickly, cheaply and easily. With instant access, salespeople can target sales propositions rather than dig through data. "Sales forces don't necessarily have very powerful machines," Greenberg says. "Salespeople are paid to sell, not to do analysis."

ACNielsen also plans to offer GlobalNet, a service that will provide market data to packaged-goods manufacturers interested in entering foreign markets. Next year, the company will



Steve Rubinow: "If you're going to do something on the Web, you might as well do it and not do it halfway."

offer the first of many country-specific warehouses, providing global access to national market information. Greenberg says GlobalNet's local warehouses—maxing out in the United States at about 500GB—will be run by each ACNielsen country office, allowing worldwide

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access to centralized information but creating decentralized knowledge centers.

Eventually, ACNielsen might open its data warehouse doors to the public. "We've got an unbelievable opportunity to provide a service to a community that is information-starved," Greenberg says. "[The Web] is a revolutionary way to get rid of obstacles between us and our clients. The obstacles are crashing down."

Greenberg says the Web also allows users to access structured information such as text documents and unstructured information such as on-the-fly data reports with the same interface, something that can't be done with client/server warehouse tools. In addition, managers can market information to end users and decision makers by tracking the information people access and how they apply it and by offering alerts of data changes. Those capabilities signal a move out of IT to sales and marketing, he says.

A NOTE OF CAUTION

Opening data to a larger base of users raises security concerns. If Jack Average can access a company's data about pretzel prices, will he also be able to access the company's secret pretzel recipe?

Rick Tanler, chairman of Information Advantage Inc., a DSS developer in Minneapolis, says security is an issue with Web integration of data warehouses; although warehouses support various levels of security and password protection, security on the Web is unidimensional. At ShopKo Stores Inc. of Green Bay, Wis., Web integrators are setting up the data warehousing connections and user-authentication procedures, creating safeguards against data and system corruption, says Gene Klawikowski, ShopKo's director of information services.

But even if sufficient security is well within reach, convincing higher-

Gene Klawikowski says
ShopKo's Web integration will be complete late this year.

ups that Web access is not pie in the sky will be difficult. Cranford says upper-level managers are hesitant to use the Web despite the fact that security options are available. "You can explain that [security is possible] to the CEO of an organization until you're blue in the face," he says. "Right now, it's bleeding edge."

Because of Internet security concerns, many companies are focusing on internal, intranet-based integration efforts or are stringing secure dedicated lines and T1 connections to business partners to support Web integration as well as proprietary or client/server systems already in place. Instead of worrying about password protection and business rules that constrain information access, companies should plan more on Web integration with data marts, which by positioning data outside a company's warehouse effectively isolates sensitive data, says Steve Gordon, managing director of global alliances for Austin, Texas-based BSG Corp., which develops client/server applications, new media and data warehouses. By designing small-scale data marts for Web-based clients and business partners, companies can offer users only the data they need and alleviate some of the Net's bandwidth concerns. "[Companies] don't have to enable all these users," he says.



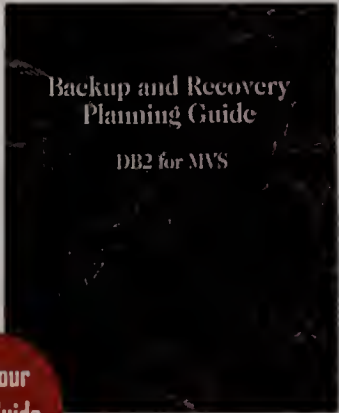
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GOING SLOW

Kelly Dowe, an IT systems analyst at United Services Automobile Association, a San Antonio-based financial and insurance services provider primarily for U.S. military personnel and their families, says he is excited about the potential of data warehousing and the Web but that the company wants to take baby steps before trying to run. "Right now the Internet is just gearing up at USAA," he says. "It's definitely something that's going to grow more and more." Starting small, Dowe and USAA created a 3GB warehouse that contains only 2.5 years' worth of data from USAA's renters insurance line of business. Renters data makes up about 3 percent of USAA's property and casualty insurance operations. About 30 employees access the warehouse with MicroStrategy Inc.'s

about 80 percent of USAA's business, to a warehouse accessed by 400 users. "The tools we needed were not out there to do decision support on the Web until [the second] quarter of 1996," Dowe says. "If we had started on [USAA's automobile data], we might've been here until 1998."

Dowe and other IT team members, who began testing DSS Agent and DSS Web in early 1995 and rolled out the renters insurance portion in May 1996,

Gateway will work and work easily, he adds.

ShopKo Stores Inc. also plans to make some of its warehouse data accessible via the Web to store managers, merchandise analysts and vendors who need accurate real-time sales information. Klawikowski says the company's Web integration will be complete late this year. Using MicroStrategy's toolset, an Oracle Corp. database and IBM Corp.'s massively parallel SP2 Unix processor, ShopKo is build-

Operational and sales managers can compose their own drill-down queries rather than simply access static data reports.

say that because of some Web-based limitations—like the inability to do full ad hoc analyses that parallel those of a client/server tool—USAA will use the Web tool along with MicroStrategy's client/server access application. "What [USAA employees] can do right now is limited just by the data, not by the functionality [of the Web]," Dowe says. "But we expect a little more future value than we see at the moment."

Bell Canada, a telecommunications provider in Ontario and Quebec, also plans to augment its traditional client/server DSS application with a Web-based warehouse interface so that hundreds of Bell Canada's business, operational and sales managers can compose their own drill-down queries rather than simply access static data reports. Currently, financial analysts field user queries and prepare reports and presentation material. Tim McCutcheon, director of information management and IT strategy for Bell Canada's business planning group, says company users will continue to use Arbor

Software Corp.'s Essbase client/server application to access the company's 42GB data mart of financial information. Users with less massive business and data needs will use Arbor's Essbase Web Gateway, an HTML-based access tool that was still in beta in the summer of 1996. McCutcheon says Bell Canada will wait for a final release before rolling it out businesswide, though. The testing the company has done so far shows Web

ing a warehouse of information to allow companies and HMO clients such as American Medical Security of Howard, Wis., to analyze health-care costs, identify pricing trends and gauge the use of generic and branded pharmaceuticals (see "Charting a Course," Page 46).

This summer, ShopKo ran a successful trial program with 20 general merchandise vendors that accessed the company's 800GB data warehouse of merchandise information. ShopKo's 200GB warehouse of prescription benefits management information will eventually be available to its clients, which are self-insured companies, HMOs and other insurance companies, Klawikowski says. ShopKo used to run periodic hard copy reports for its clients but will stop once the company integrates its warehouse with the Web. A ShopKo business partner will be able to monitor competitors' prices or see which products people buy. Klawikowski says ShopKo is investigating Web access to its data warehouses to see if that information can generate profits. While Web access to data might not open an entirely new revenue stream, Klawikowski says it will make its services and data more valuable to businesses in ShopKo's supply chain. "We know what sells in every store in every shopping basket. Vendors would like to see that information," he says. "Data is going to be very profitable if you can use the Web to access it." 

Staff Writer Heath Row can be reached at hrow@cio.com.



Tim McCutcheon at Bell Canada plans to augment a traditional client/server DSS application with a Web-based warehouse.

DSS Web application, a complement to the company's client/server-based DSS Agent access tool. Dowe says USAA will eventually move its fire, homeowners and automobile data, which makes up



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Edited by Elaine Cummings

Data Scrubbing

New tools provide better ways to clean databases

BY JOHN EDWARDS

SCRUBBING BY HAND MAY BE the best way to clean a dirty floor, but it's not an effective technique for tidying up data.

Over time, databases can accrue a wide range of inaccuracies and inconsistencies, such as misspelled names, inverted text, missing fields, and outdated area and ZIP codes. Fixing such faulty records by hand is expensive and time-consuming—and often results in the introduction of even more errors. Fortunately, over the past several years, a wide range of data scrubbing tools has appeared on the market. These tools help organizations fix their database flaws in a way that's less costly and less painful than manual mending. They include programs that correct a specific type of mistake, such as botched addresses, or clean up a full spectrum of commonly found errors.

It is absolutely critical for all organizations to periodically examine their databases for anomalies, although how often depends on the type and age of the data, says Bill Hopkins, research director of the marketing knowledge and technology service at Gartner Group Inc.'s Atlanta-based office. "Obviously, if you're dealing with critical legacy information, you'll want to examine it more often and more closely than data that's not critical to daily operations," he says.

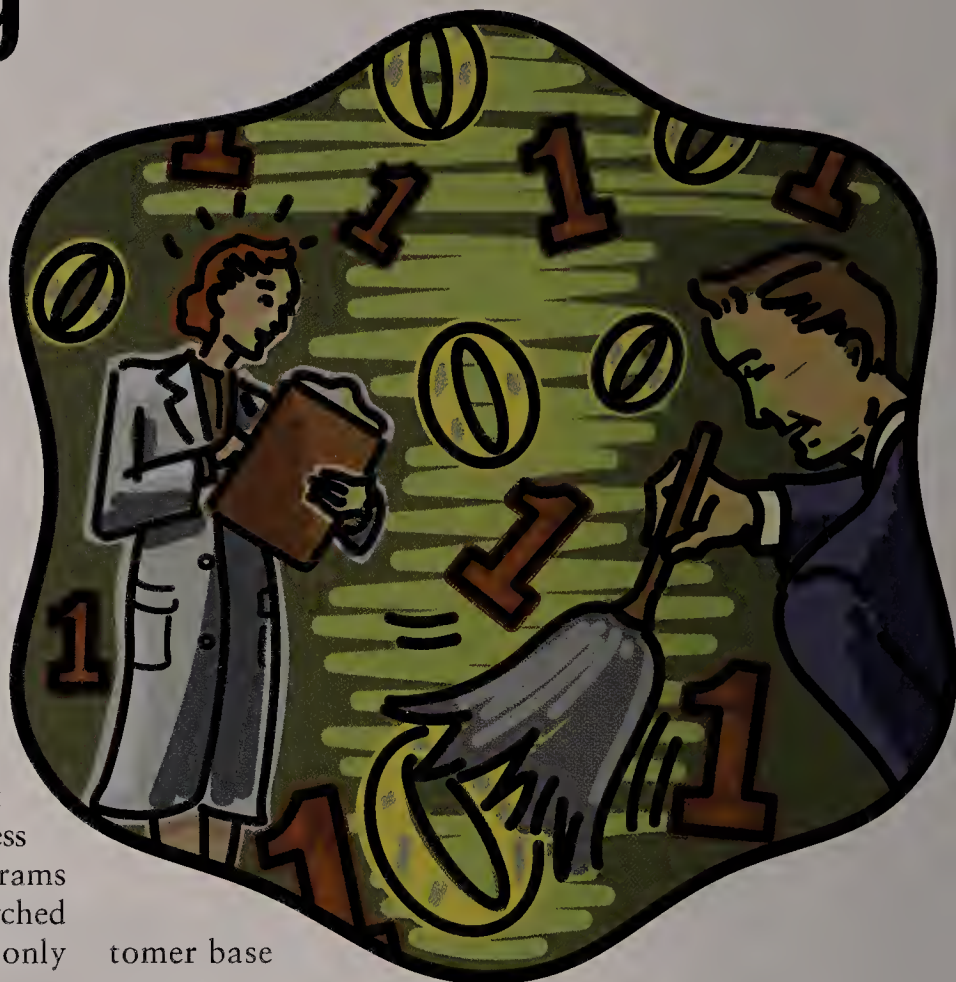
Organizations in such data-intensive fields as banking, insurance, retailing, telecommunications and transportation tend to be the largest and most active users of data scrubbing tools, according to Ben C. Barnes, general manager of IBM Corp.'s Worldwide Decision Support Solutions Group in Somers, N.Y. But as database technology becomes an integral part of practically all business and government activities, data scrubbing is also rapidly expanding to a variety of other areas as well. "Virtually any organization with an extensive cus-

tomers base can expect to use data scrubbing tools at some point," says Barnes.

Organizations typically become aware of the need for data scrubbing while implementing a data warehouse, which takes information from multiple databases and stores it in a way that gives end users faster, easier and more flexible access to key facts. But, Barnes notes, a data warehouse is only as accurate and useful as the data it holds. "Building a data warehouse with incomplete or erroneous information defeats the technology's fundamental purpose—to provide fast and accurate data upon which critical business decisions can be based," he says. "Reliable data is the warehouse's foundation."

Even organizations that purport to have perfectly clean data may eventually find themselves in need of data scrubbing software. "When you start combining data from different legacy systems, you may discover formatting problems, definition problems and other types of structural problems," says Barnes. "In this age, no organization can truly claim to have absolutely clean data."

The need for scrubbing also arises when a manager inherits an incompatible database through a merger or acquisition. "That can be a major headache for CIOs in fields where companies are swallowing each other up,"



IN THIS SECTION

Sun Microsystems

Hitachi's Integrated Notebooks

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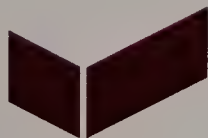
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says Geoffrey Smith, a product manager at Platinum Technology Inc., a data scrubbing software vendor in Oak Brook Terrace, Ill. "In those cases, data scrubbing tools offer the only practical way to quickly convert large amounts of data."

Organizations can select from a wide array of data scrubbing tools. One general-purpose data scrubbing product, Integrity Data Reengineering Tool, from Boston-based Vality Technology Inc., is designed to recondition and consolidate large amounts of legacy data. The software uses a series of sophisticated algorithms to identify and correct anomalies in names, addresses and other data. It also can be used to uncover data values that stray from the norm (such as a date entry of Feb. 31) or to standardize legacy file formats, data structures, and character and value representations that vary from system to system.

Other general-purpose data scrubbers include Data Quality Administrator from Gladstone Computer Services of Santa Clarita, Calif.; Enterprise Integrator from Apertus Technologies Inc. of Eden Prairie, Minn.; InfoRefiner from

"Data scrubbing tools offer the only practical way to quickly convert large amounts of data."

—Geoffrey Smith

Platinum Technology; and Trillium Software System from Harte-Hanks Data Technologies in Billerica, Mass.

Another family of data scrubbing products—limited-purpose data scrubbing tools—is primarily aimed at organizations that need to clean data but aren't involved in top-to-bottom database restructuring. Besides being slightly less expensive than their general-purpose counterpart, they are also somewhat easier to implement and manage. A typical example is Name and Address Data Integrity Software from Group 1 Software Inc. in Lanham, Md., which corrects, converts and verifies names or addresses that may use several different formats. Postalsoft Inc. of La Crosse, Wis., also offers a series of single-purpose data scrubbing products: Its Address Correction and Encoding Library corrects addresses; its TrueName Library provides name standardization; and its Merge/Purge Library consolidates database information.

Until recently, data warehouse vendors offered only simple integrity checking, which ensures that records are loaded accurately from a source data-

Sunshine Bright

Sun Microsystems scrubs away at customer data and really cleans up

TAKE A LEMON AND MAKE LEMONADE," the old saw advises. And that's exactly what Sun Microsystems Inc. is doing by taking the often onerous process of data scrubbing and returning it to its advantage.

Back in 1993, the Mountain View, Calif.-based software company realized that a pool of quality customer data would be a vital ingredient in its future growth formula. To provide managers and staffers in its various hardware, software and service operations with access to accurate

DATA SCRUBBING

customer information through their desktop business applications, Sun created a Name and Address Registry (NAR) based on Dun & Bradstreet data as well as its own internal business information. The NAR would help Sun employees obtain accurate profiles on potential, current and past customers, including records of previous sales, service history and contacts with other Sun divisions.



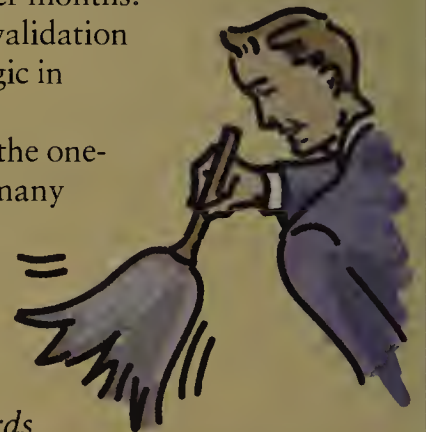
"Each business unit had its own set of applications and its own customer master files. Many of them had customers who were serviced by multiple business units," says Dan Clark, a software manager for Sun Microsystems Computer Corp., the company's hardware subsidiary, also located in Mountain View. "Sun needed to know what we were really selling to a particular company to understand where our real business opportunities were."

The biggest challenge Sun faced in implementing and maintaining the NAR would be in making sure the data was accurate. The company needed clean data to provide its sales force with readable, accurate profiles. In addition, by eliminating duplications, Sun would be able to avoid hitting the same customers with conflicting messages.

To ensure the NAR data's integrity, Sun turned to Trillium Software System, a data scrubbing tool developed by Harte-Hanks Data Technologies in Billerica, Mass. Installed at Sun's SunExpress aftermarket sales unit, Trillium works in the background to scrub away duplicates and verify customer information in real-time during order entry. Installing and fine-tuning the system took Sun about six worker months. Most of that effort involved tuning validation routines and adjusting validation logic in Trillium's table-based logic.

"Data scrubbing isn't necessarily the one-shot, over-and-done-with deal that many CIOs imagine," says Rick Wilson, national accounts manager for Harte-Hanks. "It's an ongoing process, working to ensure constant data accuracy."

—J. Edwards





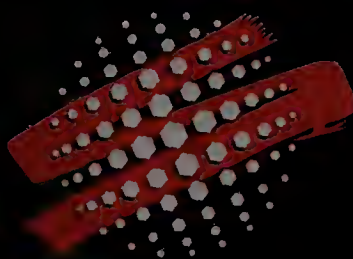
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base to their new repository but is powerless to do anything about data that's dirty at the source. Those vendors are now beginning to climb on-board the data scrubbing bandwagon. "It's the old garbage in, garbage out situation," says Hopkins. "Integrity checking doesn't address the problem at the source, where data integrity problems typically lurk."

The latest version of SAS System for Data Warehousing from SAS Institute Inc. of Cary, N.C., is one of the first data warehouse lines to include full-scale data scrubbing capabilities. Other data warehouse vendors have formed marketing alliances with third-party data scrubbing tool vendors. IBM, for example, has joined with Vality Technology to offer Vality's Integrity Data Reengineering Tool to IBM's data warehouse customers. Companies can expect virtually all data warehouse vendors to offer some form of data scrubbing support within the next year or two.

Launching a data scrubbing project "isn't like going out and buying a bottle of Windex," says Sarah Bassett, director of marketing at QDB Solutions Inc., a data utility vendor in Cambridge, Mass. Instead, organizations must devise a detailed strategy as soon as they decide to begin a data scrubbing effort. "Once you understand the condition of the data in your legacy system, you can make some astute decisions about where to scrub," she says. Bassett suggests making a baseline assessment of the data in order to determine the extent of underlying quality problems. That can be accomplished by using a product like QDB Analyze, which checks databases for data, formatting and structural flaws, or by manually analyzing a representative portion for existing problems.

The planning process must also include a "data rationalization" analysis, according to Hopkins, which will tell a CIO whether the underlying information is of value to the organization. "Data rationalization means asking questions such as, 'Why are we doing this?' 'Which department cares about which data?' 'Is there data nobody cares about?' Without that, you're scrubbing data simply for the sake of scrubbing data."

Unfortunately, for most organizations, data scrubbing is about as enjoyable as cleaning an encrusted frying pan with a worn sponge. The software is expensive, ranging in price from \$20,000 to \$300,000, depending on the scope of the project and the systems involved. The software can also be difficult to use. While many vendors say their products are "automatic," organizations are typically required to adapt data scrubbing software to their specific needs. Rules writing—telling the software to convert all instances of "N.Y." or "New York" or "New York State" to "NY," for example—can

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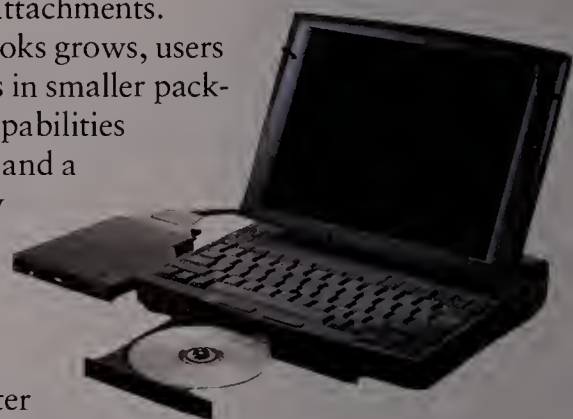
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Pushing the Plug

AS THE DIN FROM THE INTRANET bandwagon swells, seemingly every decision support system vendor and his brother is jumping aboard, offering Web integration products to complement their client/server data ware-

house setups. Pittsburgh-based Management Science Associates Inc. (MSA) seems to be two steps ahead of the parade.

Last April, MSA introduced **BusinessWeb**, a business analysis system that gives users a single, Web-based interface to a wide range of business information. Through this standalone Web browser, users can access syndicated data as well as data stored in warehouses and cor-

(Continued on Page 114)



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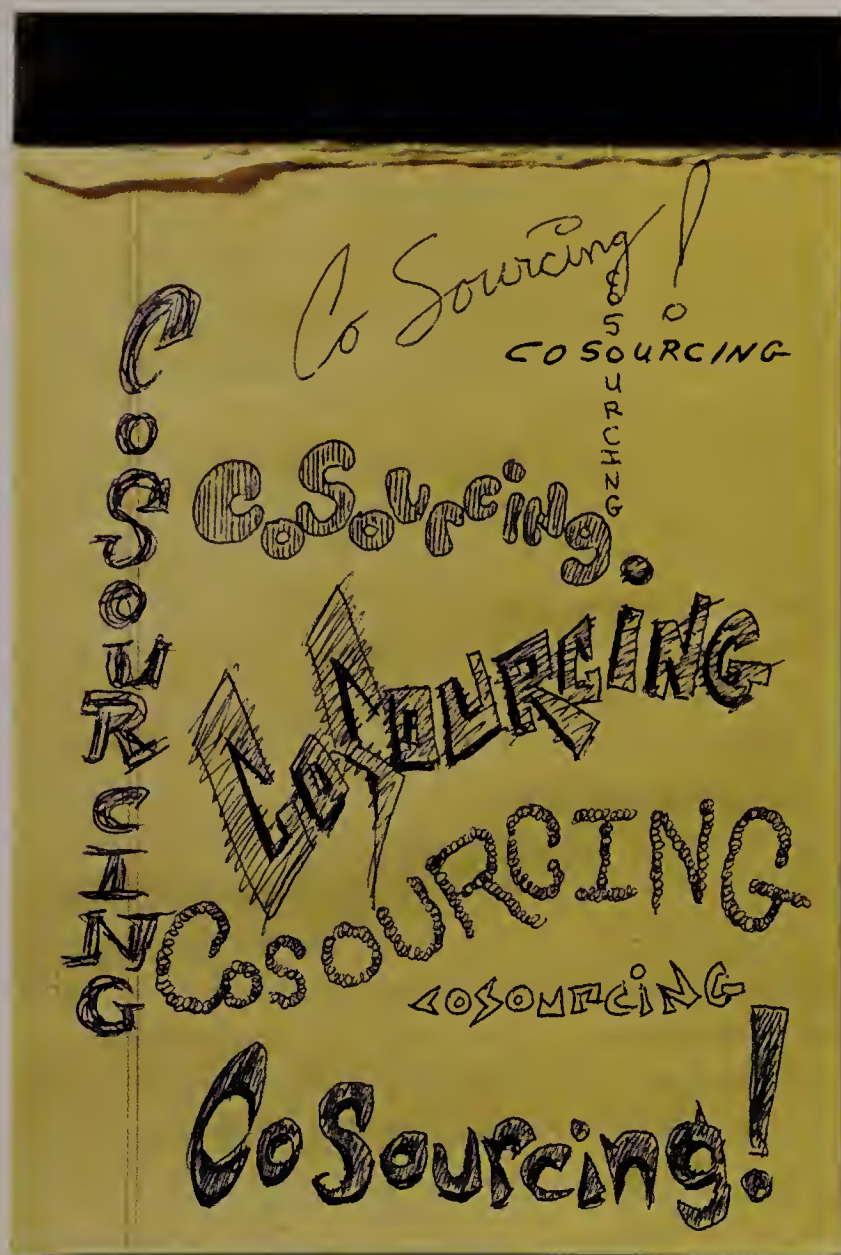
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be particularly tedious and time-consuming.

"Some products require more customization than others," says Bassett. "Vality's product is a development environment of sorts, and there's really quite a lot of work that you need to do with the product. Trillium, on the other hand, is much more user-friendly and requires less customization." The

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trade-off, according to Bassett, is that although out-of-the-box scrubbing tools demand less setup than development environment-oriented products, they also tend to provide less

flexibility in converting complex or unusual data.

Platinum Technology's Smith notes that sometimes data is so mangled that even data scrubbing technology is of little use. "If a database is full of gibberish, there's not much that even the most sophisticated data scrubbing product can accomplish," he says. "In such an event, you're back to correcting errors manually." Smith adds that databases with free-form text tend to contain the most errors, while tightly structured databases that rely on numbers and codes are generally the cleanest.

One way organizations can minimize the need for future data scrubbing is by intelligently designing database records and making sure that records on different systems are compatible. "That was a bigger problem in years past, when everyone had their own way of doing things," says Barnes. "But it's just amazing how many companies haven't taken steps to ensure compatibility on their new systems."

Another data integrity strategy that's gaining in popularity is the concept of placing a single manager, or "data czar," in charge of all database resources and responsible for making sure that the organization's data assets are complete, error-free and ready to use in the appropriate form. "The data czar is a high-visibility business-level position," says Hopkins. "He or she makes sure that information, as it flows around the company, is correct and functional."

But even a data czar can't guarantee that an organization won't run into dirty data problems at some point in the future, says Hopkins. "Data entry is where technology and people meet head-on, opening the door to a wide range of potential problems. My hunch is that as long as people are involved in creating data, there's always going to be a need for data scrubbing," he says. **CIO**

John Edwards is a freelance writer based in Mt. Laurel, N.J. He can be reached by e-mail at 70007.412@compuserve.com.

LEADING

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(Continued from Page 112)

porate databases from a variety of vendors, including Arbor Software Corp.'s Essbase and Cross-Target from Dimensional Insight Inc. (Connection to Oracle Corp.'s Express is expected later this year.) Then in June, MSA leapfrogged its own Web integration tool by reintroducing it as a Netscape Communications Corp. browser plug-in.

"MSA didn't want to be in the browser market," says Lawrence Linn, director of business analysis systems at MSA. By offering BusinessWeb as a Netscape plug-in and—later this year—a Microsoft Corp. Explorer add-on, he explains, MSA can provide data access services to more users than the BusinessWeb browser can reach alone. For more information on BusinessWeb, call 800 672-4636.

Gaining Insight

WHILE SAP AG HAS CHOSEN TO capitulate to user demand by decoupling its integrated R/3 enterprise resource planning software modules, Lawson Software is headed in the other direction, bringing out an integrated suite of its separate tools, complete with workflow software and Web capability. Lawson's rationale is that companies want to buy software to support cross-functional processes, not isolated functions. So Lawson's financials, human resources, procurement and supply-chain management modules are now being packaged as **Lawson Insight**.

A Filenet workflow and image engine is bundled with the suite, enabling personal and enterprisewide automated workflow routing between the various functional modules. Web functionality provides self-service access for both internal employees and external partners. Among the possibilities: Staff can access and update their human resources records, and suppliers can be granted access to inventory data. If the software is confined to Web servers, the company can opt to place skinny clients on the users' desktops, running little more than Web browsers.

Included in Lawson Insight is a new activity-based management application that identifies costs as they relate to cross-cutting business activities such as procurement. This approach to cost tracking has been catching on in the financial community because it fuels better strategic decision making. Lawson can be reached at 800 477-1357 or on the Web at www.lawson.com.



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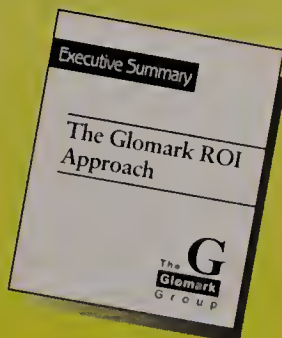
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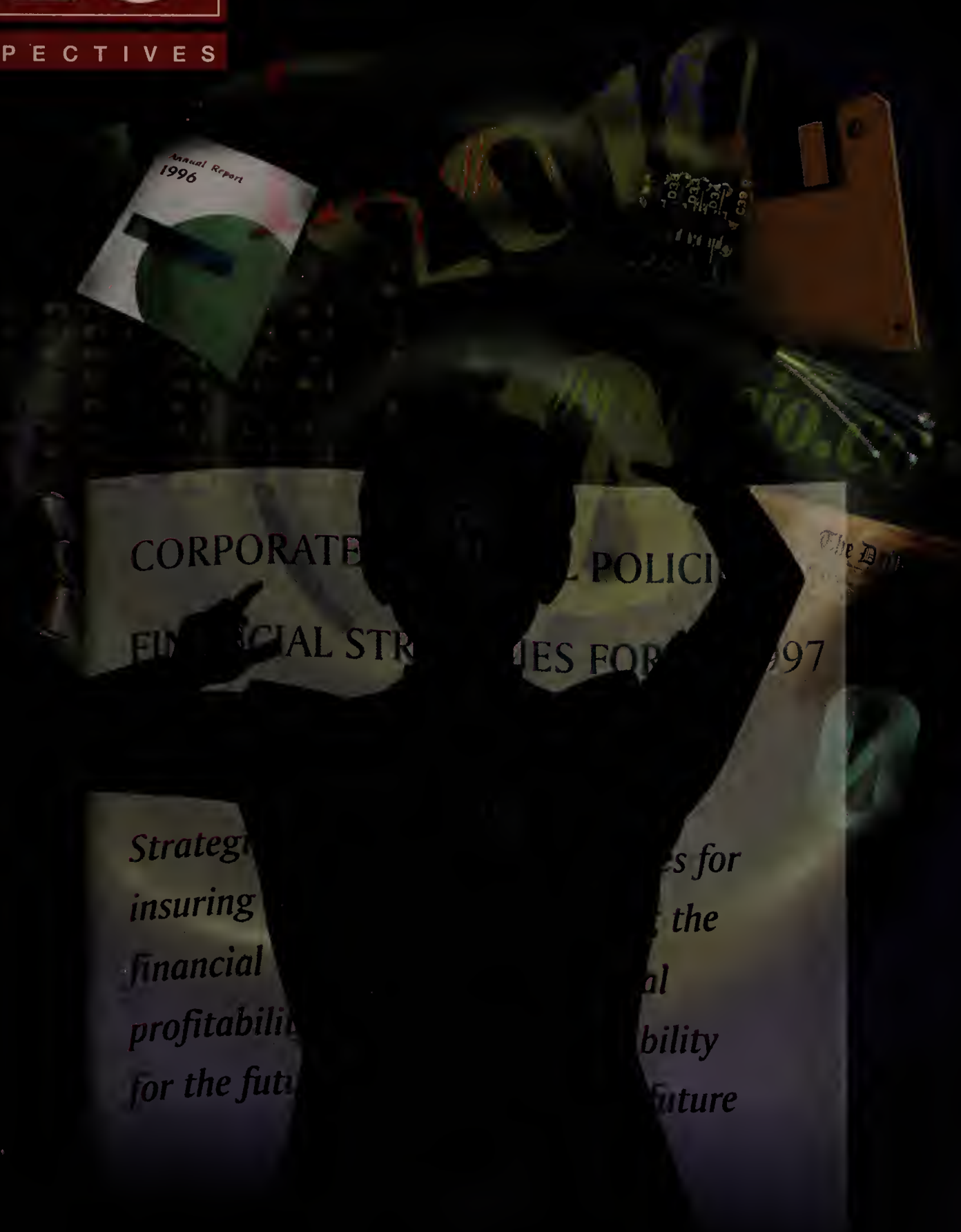


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A central image showing a person in silhouette, seen from the back, pointing their right index finger towards a collage of various business documents and reports. The documents are layered and overlapping, with some text visible. One document at the top left is labeled "Annual Report 1996" and features a green circular graphic. Another document in the center has the heading "CORPORATE POLICY" and "FINANCIAL STRATEGIES FOR 1997". A document on the left contains the text "Strategic... for insuring... the financial... profitability... for the future". A document on the right contains the text "...s for the financial... al... bility... future".

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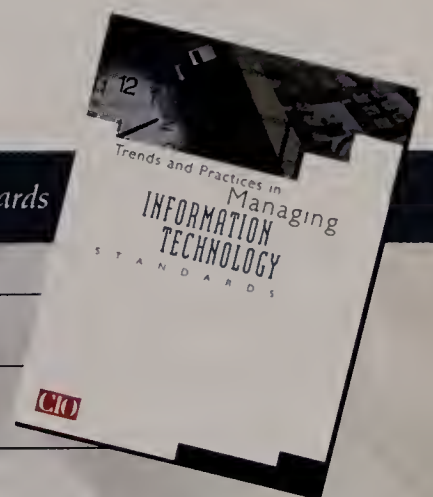
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Working Smart

MAXIMIZING THE PAYOFF FROM INFORMATION TECHNOLOGY

SUCCESSFULLY exploiting narrow windows of opportunity can mean the difference between a banner year and greater-than-expected losses. Nowhere is that more true than in direct marketing, where consumer tastes shift faster than the post office can deliver the next promotional mailing.

As a direct marketer of travel opportunities for the over-50 set, Grand Circle Travel Corp. caters to a fast-growing niche. A couple of years ago, the Boston-based company decided marketing personnel needed a better way to access critical customer information. Previously, marketing had to request reports from the IS group, a slow and often frustrating process. Then IS implemented a data warehouse and equipped marketers with access tools, letting them fine-tune promotional efforts on the fly. As a result, sales are up and the number of mailings is down, leaving IS more time to develop critical applications.

"[In 1994,] we'd create a flat file or produce a report in anywhere from a week to a month," says Charlie Ritter, senior vice president of information systems for the \$180 million company. When a 1 million-piece mailing was sent out, marketers typically couldn't analyze response rates until it was too late to follow up with additional promotions or refocus a promotional campaign. "We can't survive in this business with that kind of turnaround," Ritter says, acknowledging that IS often slowed marketing's efforts to access data.

A committee of IS and marketing staff plus an outside consultant deemed that an easy-access data warehouse would be the best way to combine information contained in Grand Circle's circulation, reservations and customer systems. Marketing

Grand Circle Travel's Direct-Marketing Data Warehouse

offered its requirements and IS selected the right tools and technologies.

In 1995, IS doubled the memory on an existing AS/400 and replicated large data files running on the in-house production systems and the mainframe-

the number of brochures received by customers with the amount of money subsequently spent on trips. Such data can be used to forecast sales, create promotions, even predict cancellations.

Working with the circulation list of 3 million names in addition to historical purchase and promotional data, analytical services can quickly create complex statistical models to predict the number of people who will respond to specific promotions and catalog mailings. The department can also use the data to spot current trends and possibly recommend a new course of action.

All of the analyses and modeling have added up to more sales for Grand Circle. Sales jumped 25 percent in 1995 following implementation of the data

warehouse. Currently, 1996 sales are 10 percent ahead of plan, according to Welter. At the same time, Grand Circle has reduced its mailings by 20 percent. Although Grand Circle won't divulge the amount of money saved, a marketing official says the 20 percent reduction translates into "substantial savings in advertising costs." Instead of attributing the savings to the bottom line, Grand Circle reinvests the dollars into more targeted and sophisticated marketing efforts. Higher sales with better targeted mailings translates into more

effective marketing. "We're much better at segmenting our customers and identifying the best prospects," says Welter.

With end users generating reports, IS has more time to deal with critical operational issues. "In the travel industry, we have to deal with things beyond our control," Ritter explains. "Because IS doesn't work with marketing like we did before, we're available to make rapid changes to our reservation software in response to changing situations."

—Megan Santosus

Vital Statistics:

- **Organization:** Grand Circle Travel Corp., Boston
- **Application:** Direct-marketing data warehouse
- **Technologies:** Historical and customer data stored on an IBM AS/400; end-user access tools include SAS Institute's Access and Visual FoxPro; IBM PCs linked via LANs running OS/2 and Windows NT
- **Scope:** Approximately 14 end users in marketing
- **Sponsors:** Mark Frevert, executive vice president, in conjunction with a team of employees from IS and marketing
- **Objective:** Give employees direct access to data
- **Payoff:** Increased sales and reduced direct-marketing costs; IS freed up to work on important development projects

based circulation system at a service bureau. With IBM ThinkPads, end users have employed tools from SAS Institute and FoxPro to access the native DB2 database running on the AS/400.

The impact of the data warehouse has been substantial, says Eric Welter, manager of analytical services for Grand Circle. "People in marketing can create their own queries, and the data comes back to them in the format they want," he explains. "We can segment our customers to a degree that wasn't possible before." Now marketers can compare



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